

# WIRED

INSIDE —

CHINA'S PLAN TO  
TURN SOCIAL  
MEDIA INTO MASS  
SURVEILLANCE

ADIDAS'S SECRET  
WEAPON IN THE  
SNEAKER WARS

ERIC RIES:  
INNOVATE  
LIKE A  
STARTUP

HOW

# MICROSOFT

GOT ITS GROOVE BACK

PLUS —  
INSTAGRAM  
VS  
TROLLS

HACK  
YOURSELF  
HAPPY!

CEO SATYA  
NADELLA'S  
MISSION TO  
TRANSFORM  
THE COMPANY

NOV 2017 — WIRED.CO.UK  
UK EDITION —

IDEAS — TECHNOLOGY — DESIGN — BUSINESS





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THE NEW FRAGRANCE





# 130

FEATURE

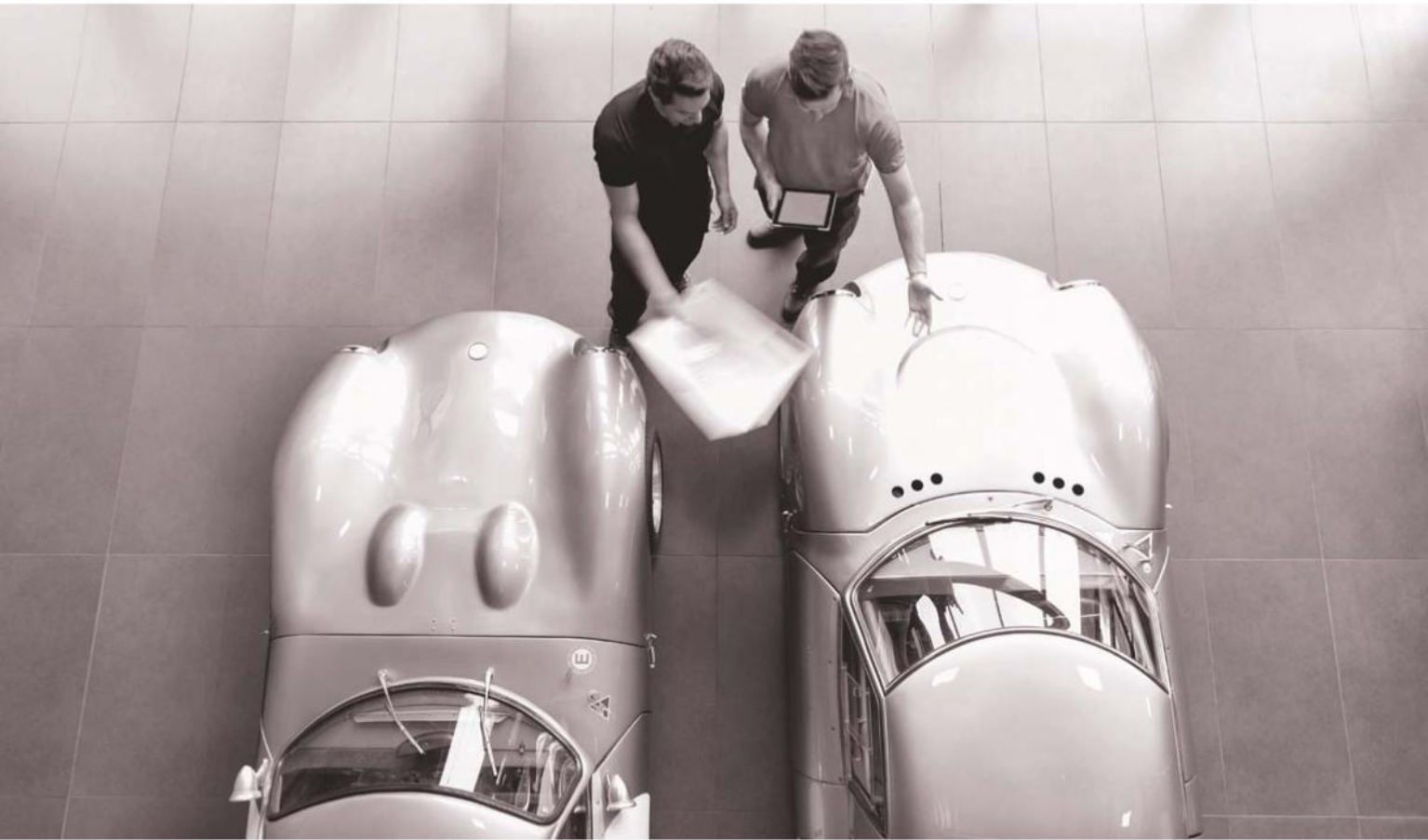
**The soul hackers**

Mikey Siegel, founder of West Coast meetup Consciousness Hacking, wants you to attain spiritual enlightenment



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## 012 START

### News and obsessions

The world's coolest apple store; apps vs oppression; troll roll call; why innovation wins wars; the Seine's concrete cruiser; veteran astronauts

## 037 GEAR

### Interiors special

From hackable sofa beds to car cockpits and transparent tables, WIRED presents our annual edit of smart accessories and furnishings

## 057 PLAY

### WIRED culture

Mean machines; Benjamin Clementine opens up; LEGO blockbusters; graphic North Korea; abstract science; *Blue Planet II*; spruced-up skyscrapers

## 077 WORK SMARTER

### Accelerated learning

Sherry Coutu's productivity hacks; Inside Index Ventures; the *Monument Valley* success story; Eric Ries's lessons in entrepreneurship

## 090 FEATURE

### Microsoft hits refresh

When Satya Nadella became the company's CEO, he set out to change its culture. But how do you transform one of the world's biggest companies?

## 100 FEATURE

### Creating utopia through art

From projection-mapped virtual waterfalls to sensor-embedded light sculptures, Japan's teamLab wants to turn the world into a work of art

## 112 FEATURE

### Taming the trolls

Instagram co-founder Kevin Systrom wants to clean up his social platform – by automatically filtering out hateful comments from users' feeds

## 138 FEATURE

### Big data meets big brother

The Chinese government plans to judge the trustworthiness of citizens with its Social Credit Score. Is this the end for civil privacy?



## 120 FEATURE

### Faster

WIRED visits adidas's European Speedfactory, the company's secret manufacturing weapon in the race for sneaker supremacy

## 148 THE WIRED INDEX

### The month in numbers

YouTube uploads, automated jobs, plastic consumption, stolen data, Google fines... here's all the data cluttering our inboxes this month

Above: Activist Firuzeh Mahmoudi founded IranCubator, the first civic-technology startup to focus on Iranian issues



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# BORN TO DARE

One of the hardest-working players in the history of the sport, he has inspired generations and the growth of football around the world. Entrepreneur, philanthropist and style icon, his influence on popular culture transcends the pitch. Some are born to follow. Others are **#BornToDare**

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# Creating WIRED



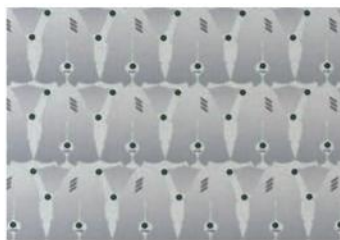
**Light fantastic**

Photographer Christoffer Rudquist immersed himself in digital-art collective teamLab's visual installations for this issue, and what he witnessed proved illuminating: "They say order comes from chaos – but, in the case of teamLab, one could say the reverse," he says. "My camera has brought me to many places and I've been fortunate enough to see a lot of things. But when I saw teamLab's world, I just stopped thinking. If meditation could be visualised, then this was it. TeamLab truly honours the spirit of creativity."



**The long haul**

Fratelli Reifer's huge and heavy MIZU table was driven from Italy to London for this issue. It then took several members of staff to lug and unpack it for shooting (our very pregnant picture editor was given a pass). Now, how do we get it back to Italy?



**Bootstrap factory**

Photographer Alastair Philip Wiper visited adidas's European Speedfactory to witness its new production methods: "It was fun to see a company the size of adidas operating on such a small scale. I've shot their factories in Asia as well, and this is totally different – it felt experimental, and everyone was really excited, like it's going to be the future."



**Rachel Botsman**

Sydney- and London-based Botsman ("It's a long commute – but I never see winter!") reveals in this issue how technology is rewriting the rules of sharing – in particular, China's plan to create a scoring system based on its citizens' social-media activity. Could such a plan ever happen in the west? "Today China, tomorrow a place near you," she says. "The west is getting closer to the Chinese system – the expansion of credit scoring into life scoring – even if we don't know it is happening."



**James Temperton**

WIRED's digital editor James Temperton flew to Tokyo to explore teamLab's mesmerising work at close quarters – and had an intense encounter with founder Toshiyuki Inoko. "Interviewing him was a unique experience," says Temperton. "Every question was met with a long pause... at one point, we sat in silence for almost ten minutes. He's a very serious person, which is somewhat at odds with his company's playful and creative output."



**Bonnie Christian**

Freelance journalist Bonnie Christian spent time behind the scenes with the *Blue Planet II* team as it prepares for another series of innovative natural-history TV from the high seas. "The crew stuck suction-cup cameras on to killer whales to get the perfect shot," she says. "I wouldn't say no to trying that myself, but it's perhaps best left to the pros. I'm looking forward to seeing marine life from the deep in a new light on the show – especially giant squid."



**General Sir Richard Barrons**

In this issue, the former Commander Joint Forces Command tells WIRED how the rules of warfare are changing fast – and having the technological edge is crucial. "It will be perfectly possible to build machines that kill on the basis of AI-enabled algorithms without a 'human in the loop'," he writes, "This raises powerful ethical and legal questions. Even if we in the west shy away from this, others in the world will likely not – so this is at least a defensive risk we have to deal with."





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# Fixing corporate culture with a system reboot

**W**hile we were finalising this issue of WIRED, Uber announced the appointment a new CEO. Dara Khosrowshahi, the former boss of Expedia, has taken on the task of salvaging the reputation of the ride-sharing company and aspiring fraternity. Uber has been mired in scandals over the past few years and is positioned as the pre-eminent exemplar of the strategic bind that many technology companies endure: to dominate a market, it's necessary to provide services at a loss. Uber towers above the competition across the world, but it does so at a cost to investors – \$2 billion (£1.5bn) in 2016 and more than \$645 million in the second quarter of 2017.

Yes, the technology company that's cited as one of the most transformational startups of the mobile era is losing as much per year as Google pays to Apple in order to remain on the iPhone, a move with a clear ROI, given the contribution iPhone users make to Google's search revenue. Turning Uber around is a huge task – its reputational challenges pale in comparison to those of its business, which depends on finding ways to limit losses. It's experimented with this in operational ways, for instance, merging with Yandex Taxi in Russia, but the move to profitability is likely to depend on a momentous manoeuvre, such as partnering with an automotive manufacturer or deploying autonomous vehicles at scale.

Khosrowshahi's to-do list will be long, but he might want to carve out some time to thumb through *Hit Refresh*, a book out this month by Satya Nadella, Microsoft's CEO and the subject of this issue's cover story. Nadella, a long-time executive at the Seattle-based company, ascended to the top job in February 2014, when the company was in decline. Its products had lost their lustre and the company's internal culture had reportedly become toxic. Executives fought turf wars, sabotaging each other, and some internal practices were resented by employees; the most storied, "stack rating", evaluated teams in groups of ten – nine would pass, with two given high ratings and one deemed to have failed.

Nadella sought to redefine the culture of the company while giving it a clear sense of purpose: he opened Microsoft up to working with outsiders and he's made some big bets on technologies such as cloud, AI, mixed reality and quantum, which he thinks will define the future.



Above: Satya Nadella talks to Greg Williams in Microsoft Building 34 at the Redmond Main Campus, Seattle

There have been missteps – the offer of unlimited, free storage on OneDrive proved unsustainable – but Microsoft has largely arrested what could have been a decline into irrelevance and has found new revenue models. Uber's investors will be watching to see whether Khosrowshahi can pull off a similar feat at Uber.



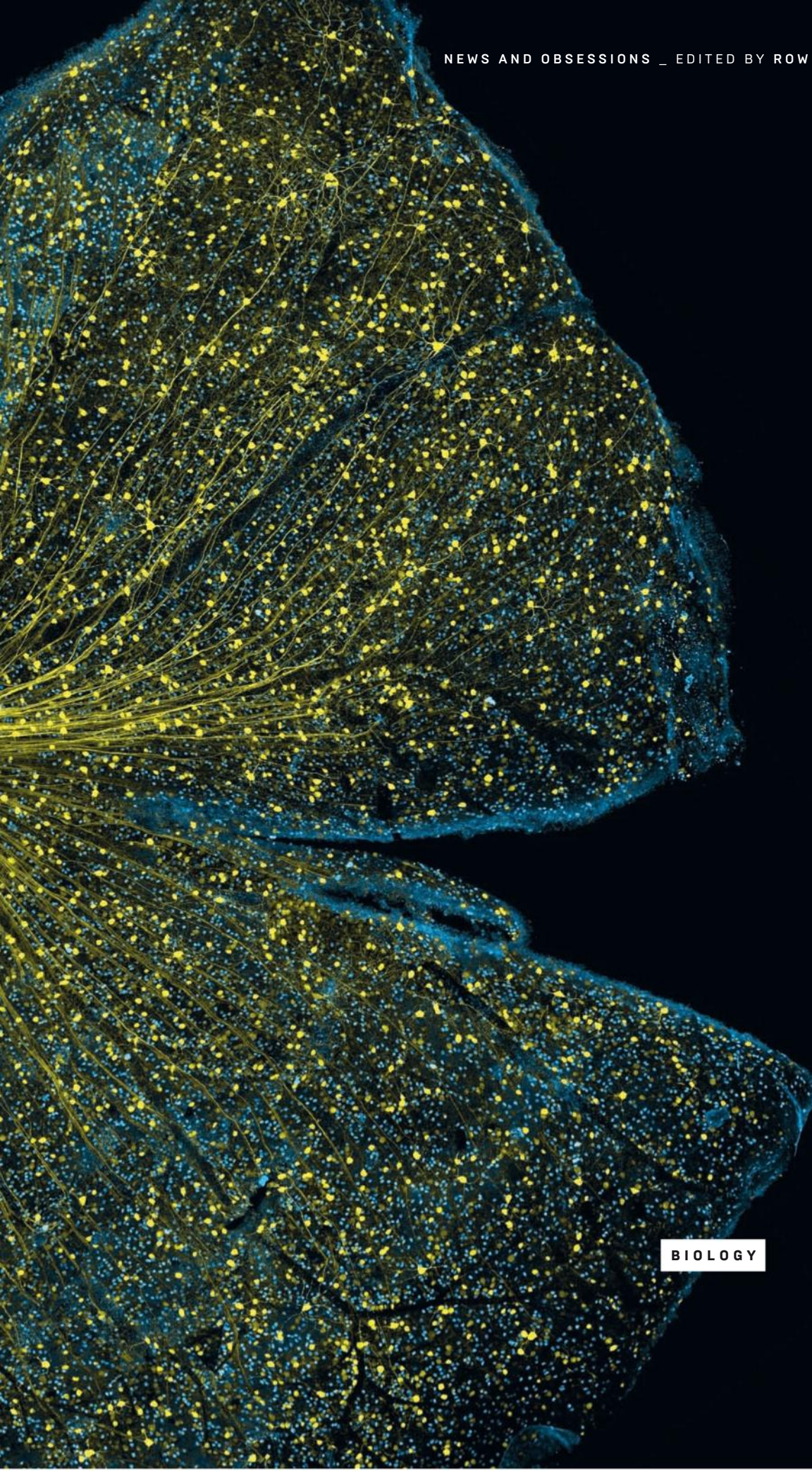
Greg Williams  
Editor



A high-resolution micrograph of a neural network. The image shows a dense collection of neurons with bright yellow cell bodies (soma) and a complex web of blue-stained axons and dendrites. The network is highly interconnected, with many axons crossing and branching. The overall structure is somewhat symmetrical, with a central area of high density and branching outwards.

# START





# BEAUTY IS IN THE EYE...

**This isn't a star-spangled galaxy, but a flattened mouse retina.** Researchers at the University of California, San Diego are using the component to trial gene therapies for degenerative eye disease glaucoma. The glowing yellow points are ganglion cells that have been targeted with a harmless virus, so they can be used as a carrier to deposit normal genes into the cells, replacing defective, disease-causing ones.

"Gene expression was broadly distributed in the whole retina, suggesting this gene-delivery system could effectively cover all parts of retinal ganglion cells," says Wonkyu Ju, co-author of the "Cell Death and Disease" paper, published in August 2015. Based on this success, the scientists will be trialling other candidate genes to enhance the eye's defences against glaucoma – which is the second-biggest cause of blindness globally. It is hoped that the research will one day lead to clinical trials that treat this problem in humans.

Emma Bryce [ucsd.edu](http://ucsd.edu)

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# APPS VS OPPRESSION

Activist Firuzeh Mahmoudi is taking on the Iranian regime – with a contest to build apps that protect civil liberties

**F**iruzeh Mahmoudi didn't mean to start a human-rights movement. It was June 20, 2009, and in Berkeley, California, the American-Irani, who left Iran after the 1979 Islamic Revolution, watched on social media as tens of thousands of reformist Iranians protested on the streets of Tehran at what they saw as a rigged election. On the outskirts of the rally, a dark-haired young woman strolled in the crowd when gunfire suddenly rang out. As video of the incident went viral, the world saw Nedā Āghā-Soltān die of a chest wound. "It broke my heart," says Mahmoudi, 46. "So I decided to do something."

Mahmoudi was determined to organise a global day of rallies in support of Iran's protesters. She took an extra week's holiday from her job at the UN, where she was on secondment from environmental health charity Health Care Without Harm, and thought about where to start. Her experience as an activist meant she understood grassroots organising – but she knew little about Iran's politics. "I googled 'Iran' and 'human rights'," she says. "Little by little we gained traction." Within three weeks, the event had commitments from 110 cities. At the march in Washington DC on July 25, there were 110,000 people, including three Nobel Peace Prize laureates.

For Mahmoudi, the march was a revelation. She left her job and started a nonprofit, United for Iran, in Berkeley. The ten-person group organised rallies – on the anniversary of the global day of action, June 25, it arranged protests in 88 cities – and documented human-rights abuses in the country. But as the regime cracked down on dissent, conventional NGO activity became increasingly difficult, especially from outside the country. So, in spring 2016 she sought a different solution.

The result was IranCubator, a contest to make Android apps that protect Iran's oppressed by promoting civil liberties. One, *Toranj*, provides victims of domestic violence with access to therapists and family lawyers. Another, *Hamdam*, is a period tracker, which also features information about taboo subjects such as STDs and marriage contracts. Like many of the contributors, its creator, French-Iranian gender-equality activist Soudeh Rad, can draw on personal experience: she was beaten by her husband but, when she asked for a divorce, realised she had no rights in Iran. *Hamdam* launched in March 2017 and has more than 85,000 users. Rad, 36, says it is "empowering women to take control over their own bodies and break taboos around women's rights".

Will it reform the Iranian regime? Maybe not. But, as Mahmoudi says, "We have to let the people of the country lead this conversation. They want evolution, not revolution." **RM** [united4iran.org](http://united4iran.org)

Right: Firuzeh Mahmoudi left Iran for America with her father at the age of 12

## PROFILE

PHOTOGRAPHY: GABRIELA HASEBUN

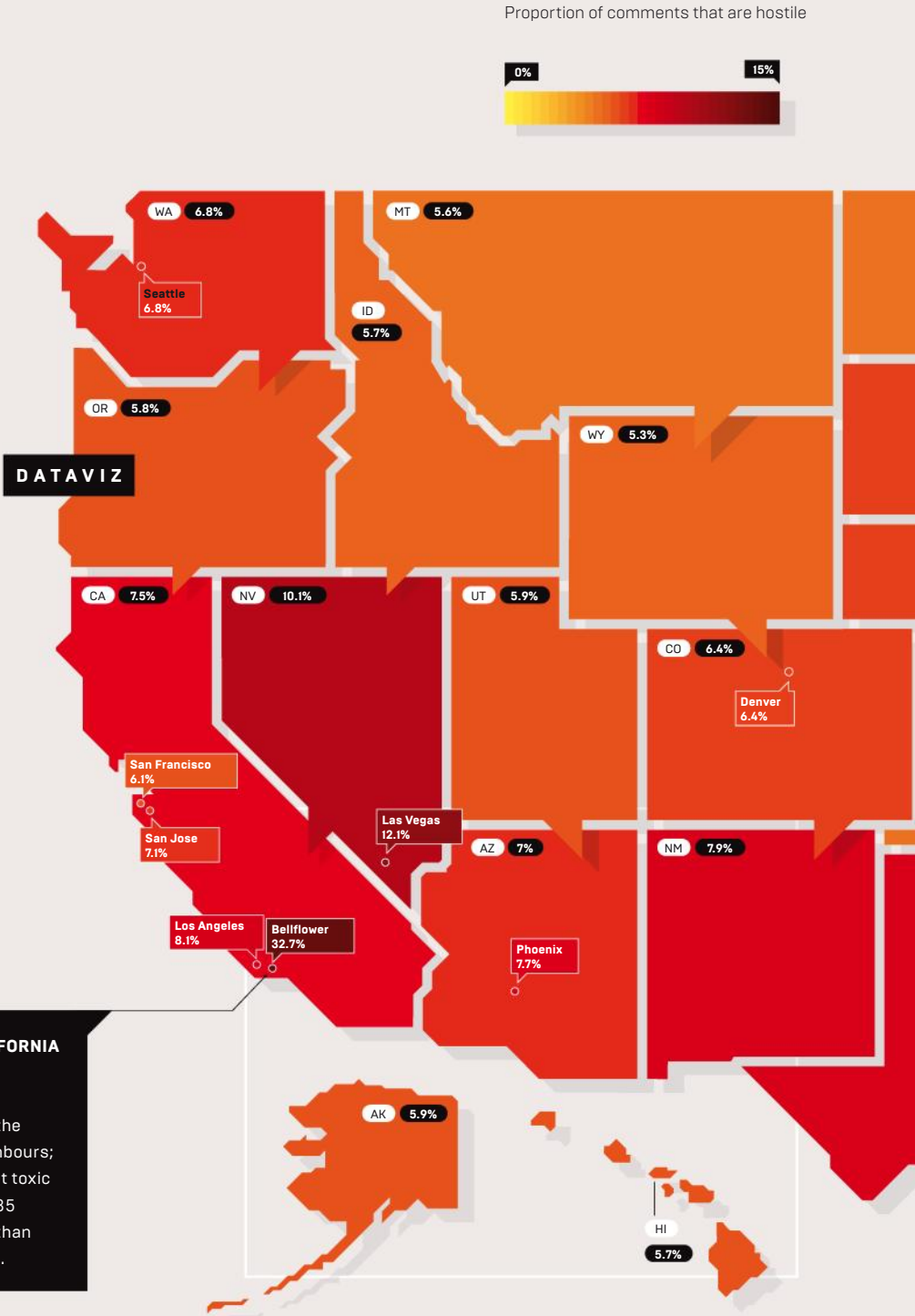


# TOXIC STATES OF AMERICA

Which is the nastiest US state? We map out the country's most poisonous online commenters

**I**nternet rule number one: never read below-the-line comments. People are not always their best selves there. To find out exactly how bad the bad behaviour is, WIRED partnered with Disqus, an online commenting platform, to quantify the problem. Co-founder Daniel Ha says toxic posts have been an issue from day one, and he sees it as a human problem, not a technological one. "It's never really going to go away," he says.

The company analysed 92 million comments over a 16-month period, written by almost two million authors on more than 7,000 forums that use the software. (So sites such as Infowars and the Wirecutter are included, but Facebook and Twitter are not.) The numbers reveal everything from the trolliest time of day to the nastiest state in the union. **Lo Bénichou**



## BELLFLOWER, CALIFORNIA

Bellflower wins the distinction of being the most unlike its neighbours; while it isn't the most toxic city in the US, it is 335 per cent more toxic than the rest of California.

## HOW DISQUS RATES COMMENTS

To determine what is toxic, Disqus uses the Perspective API created by Jigsaw and Google's Counter Abuse Technology team. They asked real people to train the API to rate comments. The model defines a toxic comment as "a

rude, disrespectful or unreasonable comment likely to make you leave a discussion". The API delivers a score from zero to one; if the comment has a score of 0.9 or above, it's considered toxic. But, as Daniel Ha points

out, "There's going to be variances to what people deem as inappropriate." Tools such as "shadow banning" also allow moderators to block users without their knowledge. If you can't see the trolls, you can't feed them...

### NOT TOXIC

Grilled cheese ideas are limitless.

Thanks for the chicken health information! My hens LOVE the mealworms, and would like for me to win.

### MILDLY TOXIC

Yes, the socialist Hitler. Far right-wing he was. Uh huh.

They have got their heads so far in the sand they'll never recognise a wolf dressed like a sheep.

### TOXIC

You are a disgusting, subhuman, painfully stupid waste of cells. You are a racist pig, a slime ball.

All liberals are devil lovers.



## VERMONT

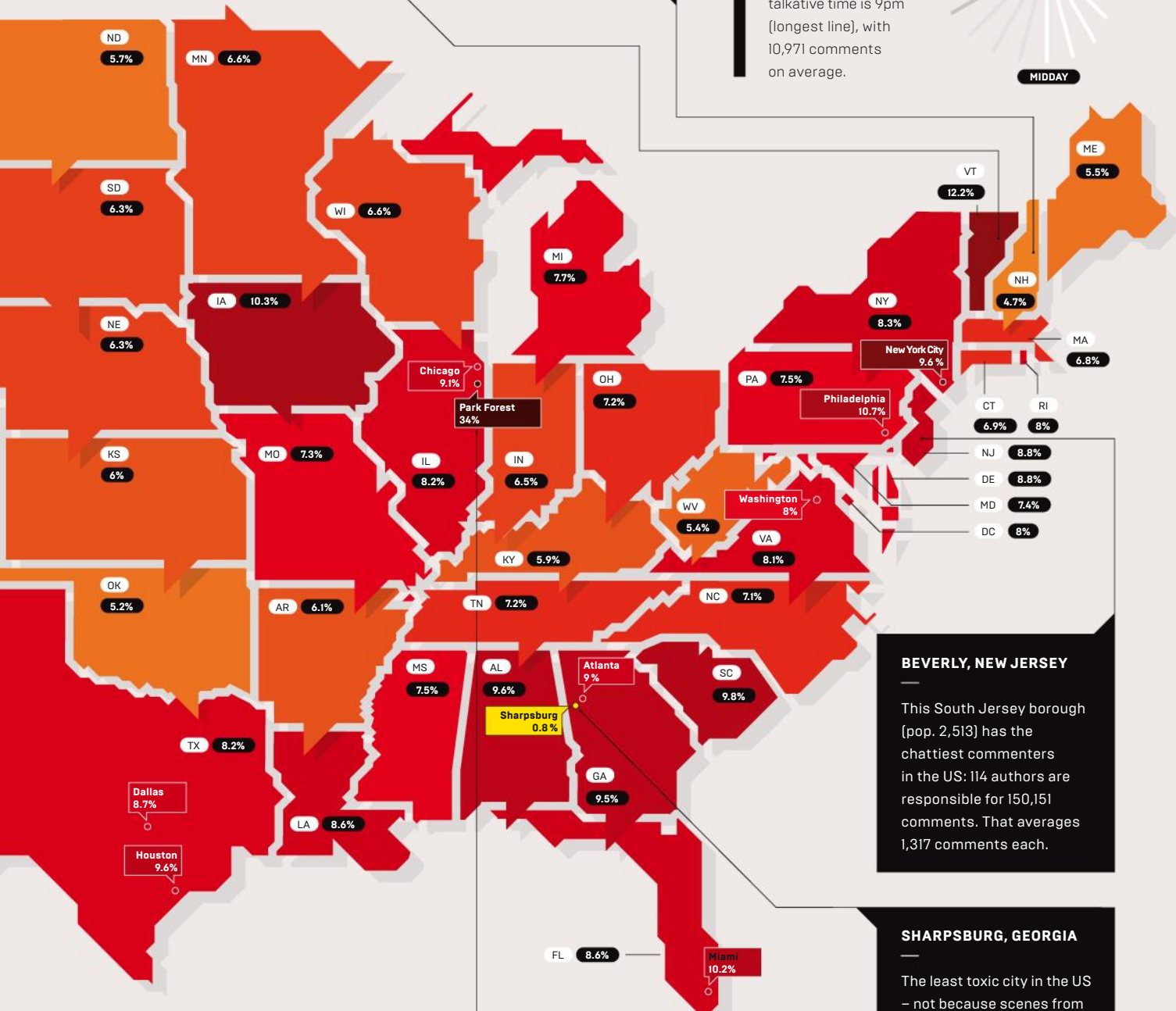
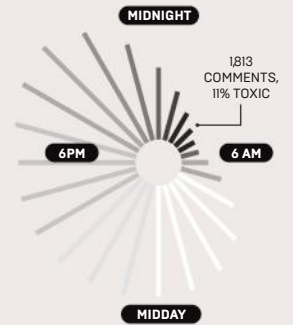
The proportion of nasty comments is higher here than in any other state.

## NEW HAMPSHIRE

Right next door, though, the home of "Live Free or Die" takes the prize for being the least toxic state in the US.

## PRIME TROLL TIME

The most toxic time of day (darkest line) is 3am – 11 per cent of comments are mean. The most talkative time is 9pm (longest line), with 10,971 comments on average.



## BEVERLY, NEW JERSEY

This South Jersey borough (pop. 2,513) has the chattiest commenters in the US: 114 authors are responsible for 150,151 comments. That averages 1,317 comments each.

## SHARPSBURG, GEORGIA

The least toxic city in the US – not because scenes from *The Walking Dead* were shot here and zombies have eaten all the trolls. It's just a small town, and the smaller the group, the more influence a few bad apples will have.

## PARK FOREST, ILLINOIS

The most toxic city in the US, where 34 per cent of comments are hostile. But 99 per cent of those come from just two authors.

## SO MANY TROLLS...

A quarter of all posters made at least one toxic comment. Look at three of your friends: one is a troll. (Unless the troll is you.)

# 25%

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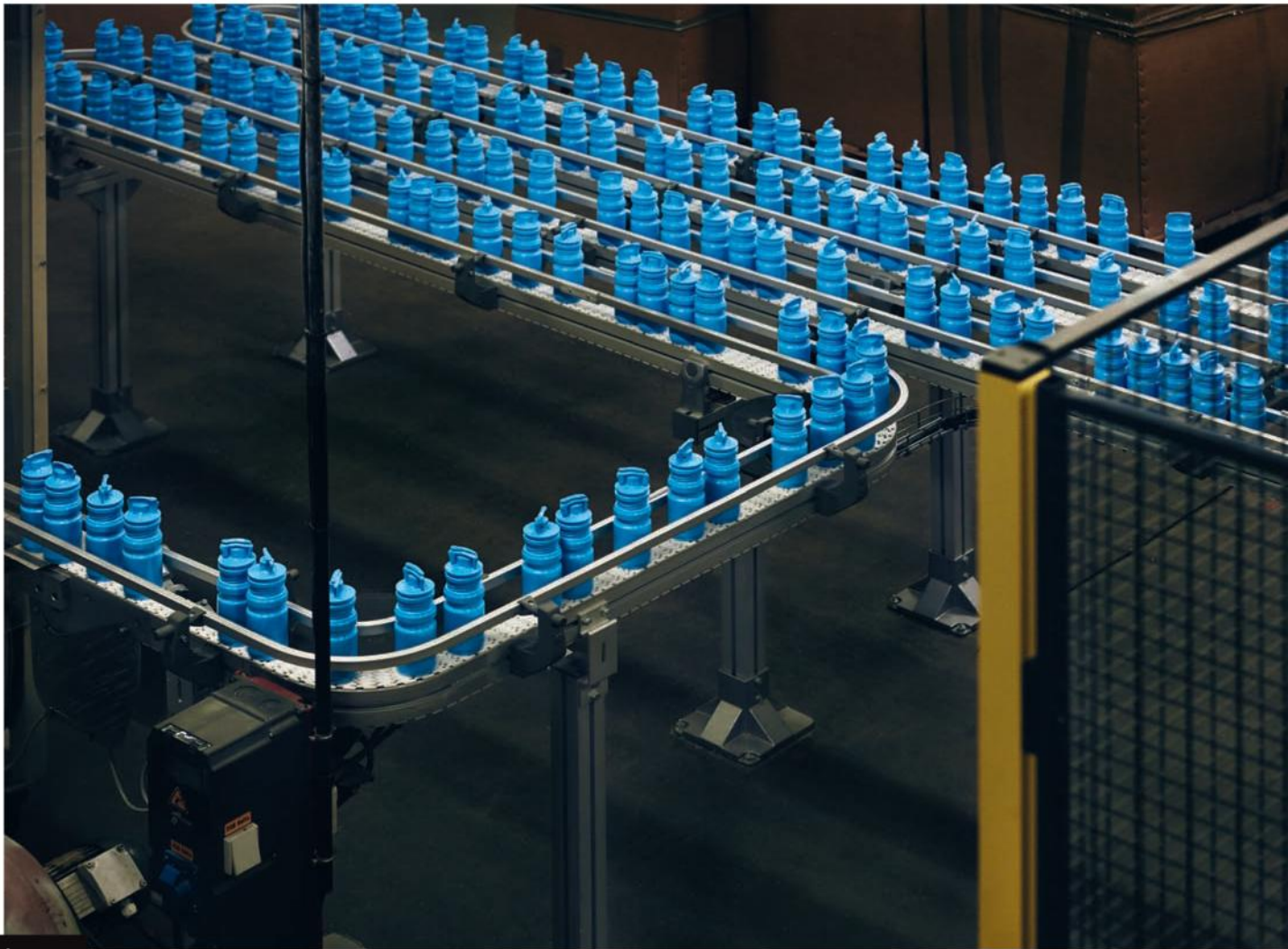
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TOOLKIT

**T**he design of a cyclist's water bottle – the bidon – has barely changed in nearly a century. “It’s always difficult to find a new or innovative design,” says Aurélien Brunet, managing director of Zéfal, “because they need to fit in a bottle cage.” Undeterred, the world’s oldest manufacturer of bicycle components has set its sights on overhauling not only the bidon’s form, but also its taste and smell.

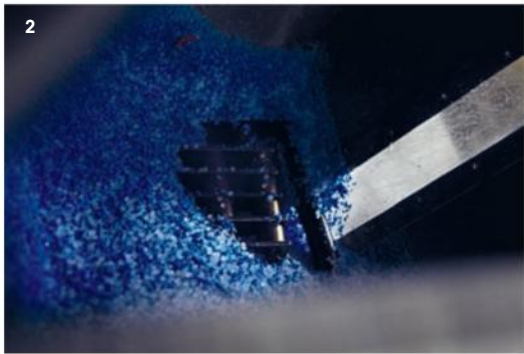
First founded in Paris in the 1880s as a bicycle-pump business, Zéfal invented the now well-known Presta valve. In 1938 the company relocated to the Loire Valley. It was here in the 70s that its product range began to expand. Zéfal sponsors professional cycling teams such as Cofidis, FDJ and AG2R, which is where water bottles are most crucial – each team goes through up to 25,000 a year. “We make around two million every year,” Brunet says.

The bidons start out as tiny plastic pellets. Zéfal uses polypropylene, one of two plastics used to make water bottles worldwide.

## HOW ZÉFAL BOTTLED IT

WIRED visits the French factory churning out millions of cyclists’ water carriers

The other, low-density polypropylene, is more commonly used because its lightness and flexibility makes it easier to work with. However, it’s also more porous, which means it harbours the lingering taste and smell associated with water bottles. “It’s hard for plastic material to be flexible, but also not have any smell,” Brunet explains. “This is where we are one step ahead.” WIRED takes a grand tour of the factory. **Bonnie Christian** [zefal.com](http://zefal.com) >



1

**Dehydration**

Before the polypropylene pellets are moulded into the bidons, drying machines such as these are used to ensure all the raw materials are completely free from moisture before being fed into the extruding machines.

2

**Extrusion**

Each year, 80 tonnes of tiny polypropylene pellets are heated in a blow-moulding machine in order to form a porous molten plastic. It is then extruded into rotating moulds and blown into the shape of a bidon.

3

**Completion**

The bidons are taken to have the Zéfal logo inked across them before being exposed to UV light, which hardens the coating. The bottles' distinct wavy shape ensures there's room for a printed design while also fitting snugly into a holder.

TOOLKIT

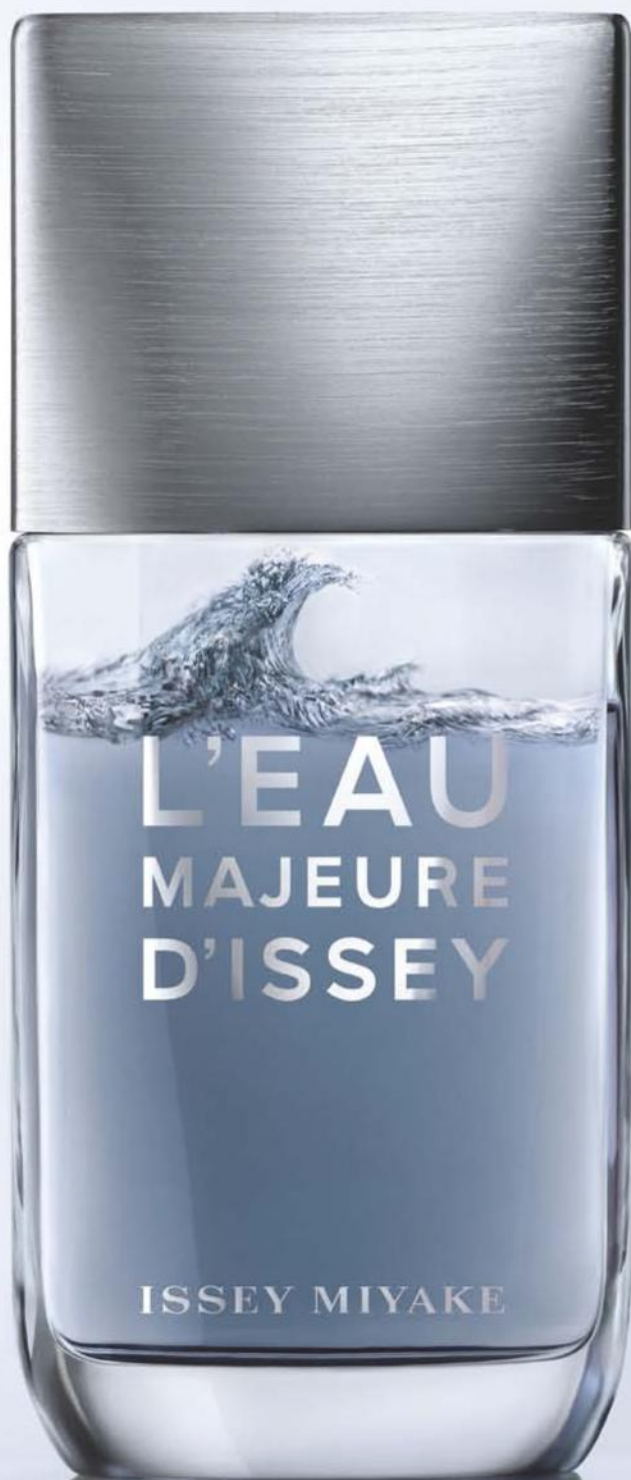
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# ISSEY MIYAKE

THE NEW FRAGRANCE FOR MEN



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**F**or a young child in search of attention, there's nothing more frustrating than a distracted parent scrolling through their smartphone. Unless, that is, their mother or father happens to be one of the 4,000 people that use *EasyPeasy*. Created by American social researcher Jen Lexmond, the app's short videos teach parents how to play, demonstrating games that capture preschoolers' imaginations. So far so unremarkable, but for Lexmond, 30, "Imaginary Safari" and "Yummy Strawberries" have a deeper purpose - tackling the roots of inequality. "I've always been very passionate about the idea that people aren't held back by their background," she says. "So much of what happens to people in life is scarily predictable at a young age."

After graduating from the University of Warwick, Lexmond (*pictured*) led a programme at the Demos think tank in London to explore why divides between haves and have-nots can be so stubborn. Her most striking finding was that the level of consistency that under-fives receive from their parents is a greater predictor of their success as adults than factors such as household income or class. Lexmond's report, *Building Character*, added to a growing appreciation of the importance of healthy brain development in early life.

Lexmond came up with *EasyPeasy* when she heard about a fund backing innovative ideas to support children in England, where nearly half of them

# KIDS' SCREEN TIME WITH A PURPOSE

Jen Lexmond's app teaches skills to preschoolers... and time-poor parents how to play

start school lacking basic skills. This includes being able to pay attention or listen to a story, according to a 2014 study by the Institute of Health Equity at University College London. Hearing at focus groups how time-poor so many parents are, Lexmond devised ideas for simple, stimulating games.

In November 2016, a University of Oxford study showed *EasyPeasy* had made a statistically significant impact in improving children's readiness for school in randomised control trials in Newham, east London, and Bourne-

mouth, particularly in terms of their ability to manage emotion, overcome setbacks and focus. "These types of skills are becoming more important because of the way the economy is changing," Lexmond says. "People have to be more self-managing." Having raised more than £750,000 from social-impact investors, philanthropists, foundations and the British government, Lexmond hopes her team of five full-time staff will expand into other English-speaking countries before launching in other languages. Children around the world may one day have reason to thank her.

**Matthew Green** [easypeasyapp.com](#)

Jen Lexmond: "*Easy Peasy* is designed to support warm, consistent interactions between parents and children"

PHOTOGRAPHY: NICK WILSON

EDTECH



**I**le Seguin (Seguin Island) on Paris's Seine is due to set sail as France's musical hub. Between 1929 and 1992, the 11.5-hectare isle housed a car factory, until automation forced its closure. Fast forward 25 years and the £153.5 million La Seine Musicale concert hall is heralding Seguin's rebirth as a cultural hotspot.

Designed by Tokyo-born architect Shigeru Ban and his Parisian associate Jean de Gastines, the 36,500-square-metre building's main venue comprises a 6,000-seat auditorium, a rehearsal hall and several conference rooms, with a huge roof garden on top. But in appearance it resembles a concrete cruise liner. "The shape of the island itself looked like a ship," Ban explains. "I tried to make the most use of the island – and it happened to take the shape of a big ship."

On realising what shape his creation was taking, 60-year-old Ban says he resolved to top the ship with

a sail. So he designed a 1,000-square-metre surface covered in 470 iridescent photovoltaic panels – able to produce 80,000 kilowatt-hours a year. The structure slides on a rail every 15 minutes in order to catch as much sunlight as possible. The sail also helps shade La Seine Musicale's architectural showpiece – the egg-shaped auditorium, the glass-and-timber dome of which is decorated with hand-laid tiles mimicking the colours of the Japanese tamamushi beetle. "The exterior is brutal, and the auditorium is like a handmade jewel," Ban says.

The hall's acoustics, devised by consultancy Nagata Acoustics, are optimised by a jigsaw of wooden panels and fireproof paper tubes – a darling of Ban's, who in 1995 built a whole church using paper.

What's the meaning of placing an egg on a ship? There isn't one. "I didn't plan an egg form," Ban says. "I wanted to make the most use of the land and the auditorium naturally happened to shape like this." Gian Volpicelli *shigerubanarchitects.com*

## ARCHITECTURE

# CONCRÈTE MUSIQUE CRUISER

The nautical design of La Seine Musicale was inspired by its watery location

- The hall has a screen at its entrance for non-paying guests to watch shows on
- The spherical auditorium is home to resident ensemble the Insula Orchestra



Above: La Seine Musicale was inaugurated in April 2017 by Bob Dylan





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*At the heart of the image*



Right: Paolo Nespoli at the Yuri Gagarin Cosmonaut Training Center in June

**V**eteran astronauts are racking up record-breaking amounts of time in space. By the time Italian astronaut Paolo Nespoli completes his latest mission to the International Space Station (ISS) in December, he will have logged 313 days away from Earth, the most for any active European astronaut. The 60-year-old, who has completed missions for the Italian and European Space Agencies, embarked on Expedition 52-53 in July with Russian cosmonaut Sergey Ryazanskiy, 42, and Nasa's Randy Bresnik, 50. They joined Nasa astronauts Peggy Whitson, 57, and Jack Fischer, 43, and cosmonaut Fyodor Yurchikhin, 58.

Between December 2010 and May 2011, Nespoli spent 159 days aboard the ISS and, in 2007, completed a two-week maintenance mission for the *Discovery* shuttle. This latest trip means that, among active European Astronaut Corps members, Nespoli will have exceeded André Kuipers' 204 days in space. (The European record of 350 cumulative days is held by retired German astronaut Thomas Reiter.)

Another record-breaker on the ISS is Whitson, who holds the title for the highest number of cumulative days in space by a US astronaut. She would have spent more than 650 days there by the time she left in September.

Agencies deploy seasoned astronauts to conduct complex tasks. But although scientists believe that micro-gravity and radiation exposure during prolonged flights put astronauts at risk of developing osteoporosis and cancer, little is known about the cumulative effects of repeated space journeys.

The experienced crew members act as test subjects to help shed light on the effects of long-term micro-gravity exposure on the human body. Yet the majority of the physiological studies that Nespoli conducted in 2011 have finished, leaving little opportunity to investigate the effect multiple trips



## LAST IN SPACE: COUNTING THE DAYS IN ORBIT

into space have had on him. "Few investigations are capitalising on their past flying experience," says Eric Istasse, head of the Mission Science Office at the European Space Agency.

Back on terra firma, meanwhile, rehab programmes restore the astronauts to their pre-flight condition. "These crew members have had long periods to recover," Istasse adds. Ready, as far as we can tell, to do it all over again. **Tina Amirtha** *esa.int*

Veteran astronauts offer experience, but little is known about the effects that space flights have on their bodies



# THE WORLD'S COOLEST APPLE STORE

Where can you store 20,000 tonnes of fruit for 11 months? In a cave in the Dolomites



**I**n the Val di Non valley in Trentino, Italy, 275 metres below ground, lies a network of abandoned mines running throughout the Dolomites mountains. For nearby fruit producer Melinda, the cool, dark conditions are, conveniently, just right for storing its fresh produce. Daniel Turri, project specialist at the company, says the Riomaggiore mines work in much the same way as a huge chiller. “Imagine a fridge like the one in your kitchen,” says Turri. “It’s bigger – but the idea is just the same.”

To keep its apples fresh, Melinda pumps air through oxygen filters into each storage cell, creating an environment that is 99 per cent nitrogen and one per cent oxygen. “The apples can still breathe, but very slowly,” Turri explains. Within four days, the fruits’ maturation has slowed to the point where they can be kept fresh for almost a year. After the rock is chilled, it can stay at a consistent temperature for years. This ensures the machines pumping out cold air work less and the amount of water for cooling is reduced. When compared to a standard above-ground storage space, the savings are equal to ten Olympic swimming pools of water and ten hectares of land. And it uses only half the amount of energy.

The Trento-based firm has two storage cells, each of which can hold 10,000 tonnes of apples. The first was made in 2014 at a cost of €8.8 million (£7.4m). Turri says the plan is to create five such cells, connected by a central service corridor. Melinda only stores apples there, but the 15-kilometre network is suitable for other goods. “Producers could store cheese or wine,” Turri adds. “There is a lot of space.” **BC** [melinda.it](http://melinda.it)



## MANUFACTURING

- Behind the Dolomite rock is a layer of impermeable rock, which prevents water from reaching the plant site.
- The apples are picked, immediately put into these cells and chilled for three days.
- Twelve per cent of Melinda's annual apple production – that's 400,000 tonnes of fruit – will be stored in the facility.
- In addition to apples, Melinda also produces berries, currants and four varieties of cherries.



## APPS OF THE MONTH



WIRED

### Nasa GLOBE Observer

Help scientists in an international experiment by collecting cloud and temperature data. *iOS and Android, free science. [nasa.gov/globe-observer](https://nasa.gov/globe-observer)*



### Seeing AI

This app for visually impaired people narrates the world around them with its camera feature. *iOS, free [microsoft.com/en-us/seeing-ai](https://microsoft.com/en-us/seeing-ai)*



### SketchAR

Feeling arty, but lack the talent? This app lets you place a virtual image on a real-world surface, so you can trace it. *iOS and Android, free [sketchar.tech](https://sketchar.tech)*



WEIRD

### Sarahah

Receive anonymous feedback about yourself from family and friends. Perfect for self-growth – or if you need a good cry. *iOS, Android, free [sarahah.co](https://sarahah.co)* **EP**

**W**hen it comes to augmented and virtual reality, Ed Barton has been there and got the T-shirt. His Brighton-based startup Curiscope produces The Virtuali-Tee, a garment printed with a stylised QR code that resembles a rib cage. Hover your phone over it, and using its app, you can explore the human chest cavity and peer at the heart, lungs and veins. "We use a mix of VR and AR to see inside the anatomy," explains Barton, 28. "With positionally tracked

## IT TAKES GUTS TO BUILD A VR STARTUP

Ed Barton's Virtuali-Tee blends augmented and virtual reality to let you see what you're made of

AR, you can position VR experiences physically within your environment." Curiscope has sold more than 3,000 Virtuali-Tees: now, Barton and fellow co-founder Ben Kidd have raised almost \$1 million (£780,000) in seed funding from LocalGlobe.

When the pair founded the company in 2015, they began making 360° YouTube videos. Their first upload in January 2016, featuring a shark dive, became one of the site's most-watched VR videos. But they felt something was missing. Surely there was more to VR than videos? For Barton, the solution was positionally tracked AR, which lets them overlay 3D imagery on to the material world. "YouTube is fantastic, but doesn't give us the scope to do transformative work with physical products," Barton says. With positional tracking, he says, "we have a blurring of physical and digital items, and an experience more tightly connected to reality". This was the birth of the Virtuali-Tee. Barton and Kidd conceived the product in March 2016 and went into production thanks to £74,000 in Kickstarter funding. "With the Virtuali-Tee, AR is your interface and VR is used to transport you somewhere else. The technologies should be merging."

Next up for Curiscope: the launch of the Great White Shark AR app, due to coincide with the autumn release of iOS 11. Barton and Kidd's book, *All About Virtual Reality*, is published by Dorling Kindersley and available now. And in November, the pair will launch Operation Apex, a VR experience with HTC Vive Studios in which people are placed in a virtual environment with sharks. "We began talking with Vive Studios in 2016 and realised there was a big opportunity to be at the centre of this technology," Barton says. Eleanor Peake [curiscope.com](http://curiscope.com)

PHOTOGRAPHY: ILKA & FRANZ

### WIRED

*The Dark Crystal*

Purging LinkedIn

Tokenize

Jailing tech bros

Third Thumb Project

### TIRED

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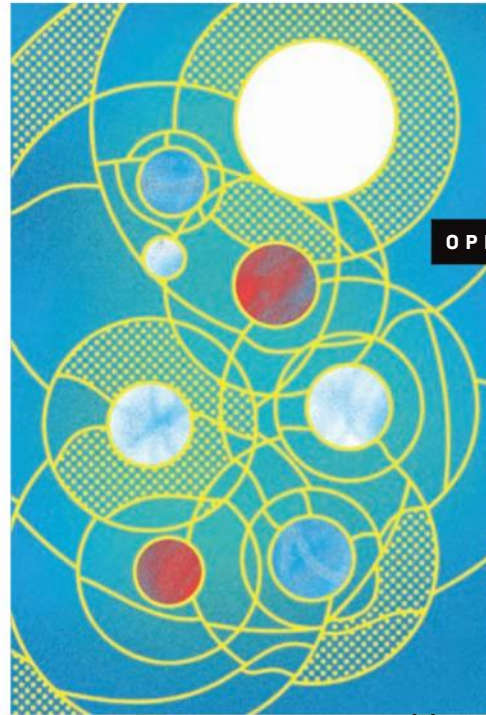
# WAR IS COMING – AND INNOVATION WILL WIN

Everyone is a target in today's connected world, says former Army general Richard Barrons

**I**f the day comes when you wake to find the tap produces no water, your mobile has no signal and your local supermarket is out of essentials, you may have become an unsolicited participant in cyber war. If that day includes the destruction of key power stations, 10 Downing Street demolished and the Bank of England left a smoking wreck by high-precision ballistic and cruise missiles, you will be witness to war in the Information Age. If the day ends with the underpinnings of modern life shattered: the undersea fibre cables that connect all developed economies cut, the destruction of international airports and all oil refineries, then that war will be “existential”, a matter of national survival. This is fortunately a fiction in our comfortable life of today, but it is not science fiction: just as the Fourth Industrial Revolution is transforming our lives it is already changing – and will change profoundly – how we confront each other and fight in this century.

We in the west have lived our recent lives free of the sense of existential peril that loomed over us in the 20th century and we declared dead at the end of the cold war. We do worry about terrorism at home, but unless this turns to the use of weapons of mass destruction (think home-cooked anthrax being sprayed in busy city centres) we don't sense that it threatens all our lives at once. But the present comfortable period in our history is not guaranteed to endure as our world changes, and there are already modern military capabilities (beyond nuclear weapons) that could affect our homelands and vital interests abroad, at virtually no notice and with devastating consequences.

We should not be surprised by this. War is war, a feature of human existence as old as mankind itself and unchanging in its essential nature: brutal, feral, unbounded and irrational in how it plays out, even if rationally committed to at the outset. It is about killing and destroying faster than the enemy, and likely driven by red mist more than good judgement, until the will to fight is depleted by blood, devastation and a widespread sense of futility. This is the lived



experience of millions today, from Aleppo to Mosul to South Sudan. This is the threat hanging over the Korean peninsula, and even over Europe and Russia amid testy relations.

A peaceful generation in Europe does not change what war is. Yet the character of conflict – how war is fought – always changes as thinking and technology advances. The arrow gave way to the bullet, the horse to the tank, the battleship to the aircraft: these inflection points (always processes rather than events) occur throughout history – and in our time the power of information (in data, processing, connectivity, AI, robotics, bio-science, materials, autonomy and all the rest) is the latest inflection.

We are already living with rapid advances in the precision, range, stealth and lethality of ballistic and cruise missiles. Big military platforms such as ships and airbases can be struck from very long distances. Used with the strategic cyber capability some states now operate, war can be

made by “stopping daily life” through the targeting of all forms of critical national infrastructure. Just as in the Blitz of 1940-41, civil society is once again “on the pitch” in modern war.

The unhindered access to the skies and the sea that Nato enjoyed during the Balkan, Afghan, Iraq and Libyan campaigns is no longer a given. The missile is starting to trump the aircraft and the ship, and the west has lost its edge. Russia and China have looked at western militaries since 1989 and invested in equipment to secure territory in air and sea, dominate space and the electro-magnetic spectrum, and to strike at iconic capability like aircraft carriers rather than match them. The west will struggle to penetrate these defences or stop missiles that may one day come in large numbers.

Nor is war in our time just, even mainly, about explosive destruction. Important as bombs and missiles >

are, the synchronised and constant manipulation of all forms of communication: political; diplomatic; state, commercial and social media; paid-for influence; and expert cyber intrusion is now a daily part of how states compete, confront and conflict. For some, there are few constraints and no obligation to value the truth in prosecuting “full spectrum” information activity. Liberal, values-based, law-abiding democracies are at a disadvantage here. “Fake news” is just a taster of what harm can be done through pervasive information manipulation used against open societies as a weapon of war.

The same wide span of Fourth Industrial Revolution technology (data, processing, connectivity, AI, robotics, bio-sciences, autonomy and so forth) that is changing how we live, work and play will now transform the way war is waged – in a process spanning at least a generation. The lead is with rapid and large-scale innovation in the civil sector, as seen in Silicon Valley and many other sectors. Military transformation will largely be about the rapid adoption and adaptation of civil-sector-derived technology and methods in disruptive military applications. Open-source big data and AI will be at the heart of intelligence systems; commercial low-Earth orbit CubeSats will provide much of the imagery formerly done by expensive geo-stationary military satellites – in a far more accessible and low-cost way; unmanned vehicles on land, at sea and in the air will replace some of the humans now in harm’s way

## OPINION

# How much military control can be delegated to AI?

– reflecting how Amazon runs its warehouses and Google makes driverless vehicles.

The future of military success will now be owned by those who conceive, design, build and operate combinations of information-based technologies to deliver new combat power. Caution, bureaucratic inertia, vested interest and institutional preference for evolution won’t work: this will only leave room for competitors to steal decisive advantage in the most challenging of competitions on Earth.

So it is going to be a race to victory, and it raises many interesting questions.

**In our connected, globalised world, if there is** nowhere that can be considered “off the pitch” in confrontation and conflict, the idea in the west that wars only happen abroad and only on the west’s terms will not persist. Cyber vulnerabilities are the most striking example, yet how many governments, institutions and businesses see that they may be confronted by more than disaster and terrorism – and what are the legal and other obligations to even consider about this? For example, how much military control can be delegated to AI in acquiring and assessing intelligence, analysing data and working out courses of action? Where does accountability sit?

How do we feel about autonomy? It will be perfectly possible to build machines that kill on the basis of AI-enabled algorithms without a “human in the loop”. It raises powerful ethical and legal questions. Even if we in the west shy away from this, others in the world will likely not – so there is at least a defensive risk to deal with. But if war can be fought by putting machines

in the vanguard rather than our 19-year-old sons and daughters, why would we not want these machines – and might we then be tempted to go to war more easily?

At what point do we withdraw from the current stars of big military inventories? They must give way, but the politics, the consequences for alliances, the trauma for current militaries and the costs will be immense. The potential costs of not changing will be greater.

Finally, the key to success is to be bold and transformative in building military competitive edges, but how will this be done? In most cases the technology is led by the civil sector with no thought of the military applications, and militaries really do not know what is out there that could be adopted. Some have started: the Pentagon’s Third Offset initiative is exactly about this. Getting it done well, at pace and against stiff competition will need bridges and partnerships between government, armed forces, industry, research, academia and the law.

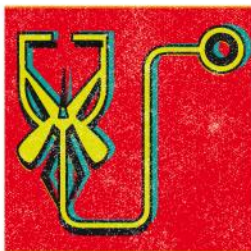
It is time to get going, and it needs the people who know technology in our universities and industry to put ideas to governments and armed forces. The sort of agile collaboration that hot-housed dealing with complex, mass improvised explosive devices in Iraq and Afghanistan showed what can be done. Now let’s do it.



**General Sir Richard Barrons**  
was Commander  
Joint Forces  
Command from  
2013 to 2016

ILLUSTRATION: AYALA TAL

# AI: ONE STEP AHEAD OF OUTBREAKS



**Medical startup AIME (Artificial Intelligence in Medical Epidemiology) can spot where the next dengue, Zika or chikungunya outbreak will be – three months before it occurs.** By analysing 270 variables including population density, wind direction and mosquito breeding sites, AIME’s model can pinpoint likely disease hotspots within a 400-metre radius and has a prediction accuracy of more than 83 per cent.

The model was used in the run-up to the 2016 Rio Olympics, and AIME recently launched a free smartphone app in Malaysia, where on average 20 people die from dengue fever every month. Beat Dengue helps locals to check if they’re in a high-risk zone, report cases, upload pictures of potential mosquito breeding sites, assess possible dengue symptoms and obtain information. If all goes well, Beat Dengue will launch in Singapore, Indonesia and Thailand later in 2017. Bite that, mozzies... **Sandy Ong** [aime.life](http://aime.life)



# oppo

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# GEAR

INTERIORS SPECIAL

## Germans Ermičs Ombré Glass Chair

Amsterdam-based designer Germans Ermičs conceived his solid-glass furniture after “wondering what colour would look like if I stretch or fold it as if it were a 3D shape”. This range, which includes a purple mirror, a blue shelf, a green table and the Shiro Kuramata-inspired chair (*pictured*), features strong colour pigments that fade to clear. The edges display the lightest tones, with the boldest shades touching at the joins between panes. [Epoa.germansermics.com](http://Epoa.germansermics.com)

#### Jasmin Gröschl Dollhouse

This doll's house was conceived for those parents who appreciate the finer aspects of design and who don't want their perfectly curated living spaces tarnished by garish lumps of brightly coloured plastic. Crafted from walnut plywood and acrylic glass, this tasteful mid-century-style maisonette folds shut to look more like a vintage gramophone cabinet than a cheery play centre. *£poa jasmingroeschl.com*



INTERIORS SPECIAL

#### Menu Plinth

Scandinavian design brand Menu creates beautifully simple and unquestionably stylish products using the finest materials. This low coffee table gives the impression of a solid slab of polished stone. The precision engineering, however, means you don't need a fork-lift truck to move it, even though it's made from 120kg of white Carrara marble. *£1,349 clippings.com*





### Mini Trigonos L

This 130-piece building set, which includes blocks, sticks, pentagons, fabric and a cardboard house, is aimed at children aged four and above. Don't tell the kids, but the blend of geometric shapes that require concentration and creativity have been engineered to provide hidden lessons in proportions, distances, volumes and angles. €59.50 [trigonos.cat](http://trigonos.cat)

### Umut Yamac Perch Light

Crafted from folded archival paper, LEDs and brass, the Perch Light is a kinetic counter-balanced lamp that glows at the slightest touch – even a minimal breeze will set the birds bobbing. Designed by Umut Yamac, this illuminating product is available as a floor, wall, table or branch light. £3,114 [moooi.com](http://moooi.com)



## Kids

Clever games and toys that will educate children – and keep adults entertained



### Phim Rutschauto Nimble Kit

Supplied flat-packed and Airfix-style in laser-cut sheets of untreated birch plywood, this push-along go-kart slots seamlessly – and beautifully – together using nothing more than plugs and screws. The combination of rigid base, stainless-steel axles and rubber-trimmed tyres ensures a smooth ride for toddlers and a satisfying build for the grown-ups. €249 [phim-berlin.de](http://phim-berlin.de)

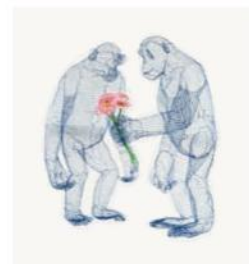
### Noook Archi-play

When your kids grow out of building dens in old boxes they need Noook, an original building-block system made from innovatively shaped interlocking cardboard pieces. The butterfly-shaped disks slot effortlessly together and provide a rigid structure, which is ideal for encouraging children's architectural instincts, or simply for keeping them quiet. £poa [noook.co.uk](http://noook.co.uk)



### Benedetta Mori Ubaldini

This Italian artist does extraordinary things with chicken wire. Her 3D designs, including giraffes, crows, pandas, and, WIRED's favourite, chimpanzees, are startlingly accurate, beautifully executed and vibrantly coloured. Despite their size, they seem weightless. €5,000 [rossanaorlandi.com](http://rossanaorlandi.com)



### Magis Little Big Chair

Magis's range of perfectly proportioned children's furniture proves that intelligent design isn't exclusively for us grown-ups. Made from polypropylene and solid ash, the adjustable-height chair grows with your kids as they progress from the age of two to six. It offers seat heights of 27cm, 32cm and 36cm, plus a T-shaped non-tip base for extra stability. £141 [magisdesign.com](http://magisdesign.com)





# Office

Smarten up your workplace with this selection of beautiful yet useful pieces

## 1 Tom Dixon Fade

The designer's blow-moulded polycarbonate pendant light continues his impressive recent run of form. Described as a light cannon, the 48cm-tall design, which is available in chrome, copper and gold, works more like a spotlight, funnelling the bulbs' glow through the narrow opening. £530 [tomedixon.net](http://tomedixon.net)

## 2 TIP Table Lamp

Cast from powder-coated aluminium, this lamp is named after the laser-cut grooves that accentuate the head of the shade. It's available in black, white, olive and copper brown, and features a diffuser and dimmer, exemplifying the simplicity of great form and basic function. £235 [muuto.com](http://muuto.com)

## 3 Libero Rutilo Vases

Designed to encourage upcycling, these 3D-printed vase sleeves slip over plastic water bottles to create a geometric mesh design. Styles include Spider, an organic biomorphic pattern, and Lace, a crochet design. The eco-minded printing method also helps to cut down on wasteful production. \$10 [designlibero.com](http://designlibero.com)

## 4 Kinesit Trestle Swivel

This Lievore Altherr Molina-designed chair has a three-position recline and adjustable lumbar support and is available in a dizzying array of materials and colours. The fixed armrests and back-shell panel can also be colour matched to your scheme. From £760 [arper.com](http://arper.com)



## 5 Fratelli Reifer MIZU

Pushing the traditional art of steam bending to the absolute limit, this four-metre-long desk has been made using ten sheets of eight-metre ply, glued and arched to create an impressive workstation. The design flows like a wave to create a seat, worktop and legs, all from a single piece of timber. Only nine will be made, each one fitted with an electrical connection including power sockets and USB charging ports hidden within a drawer. £36,000 [frustom.eu](http://frustom.eu)



INTERIORS SPECIAL

ALSO ON THIS PAGE:  
GEORGE NELSON VITRA  
NIGHT CLOCK; ISABELL  
GATZEN CRYSTAL  
DECANTER; MUUTO  
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LIVING BRASS PENCIL  
CUP; FERM LIVING  
BRASS OFFICE TRAY;  
FERM LIVING DUAL  
FLOOR VASE

## Benedetta Tagliabue Dome 180

Designed for Bover, this complex and strangely captivating ceiling light is constructed from hand-cut pieces of wood. This example was assembled from more than 170 segments of beech veneer, which were individually sewn together to create a spectacular 183.5cm-diameter chandelier. An LED bulb is positioned away from the body, ensuring that an intricate pattern of light and shade is cast across everything that falls into its path. Smaller versions (90cm and 60cm) are also available. €10,296 [bover.es](http://bover.es)



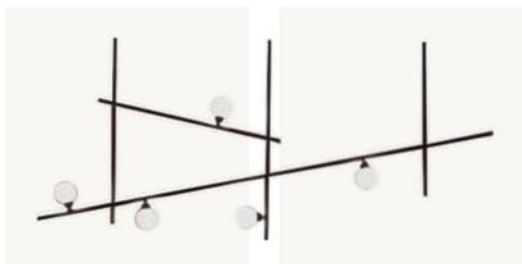
# Lighting

Modern design and sophisticated technology combine to create perfect illuminations for the home and workplace

## Flynn Talbot Freeline

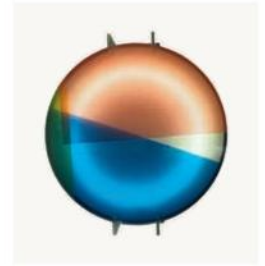
Inspired by the principles of scaffolding, the Freeline is a modular LED lighting system made using aluminium, optical polymer and glass. Each pole is held in place with

discrete clamps, allowing for an almost limitless number of design configurations. Choose from diffusing spheres or disks, or more direct spots, to create totally personalised illumination. €poa [flynnthalbot.com](http://flynnthalbot.com)



## Sabine Marcelis Voie

This Dutch designer's lighting collection combines an elegant neon bulb set in a cast polyester-resin base. While the top half of the bulb illuminates the room, the vibrancy created at the bottom is muted, but still visible. This allows it to illuminate and enhance the material's colour from within. From €1,400 [sabinemarcelis.com](http://sabinemarcelis.com)



## Visible Light

UK-based onedesignspace, founded by Dessislava Madanska, has developed this interactive concept piece, which allows you to play with colour. It's based around a single orb of white light, and a rich palette can be created by manipulating a series of geometric colour-dyed shapes across the surface. £940 [onedesignspace.com](http://onedesignspace.com)

## Jussi Ängeslevä Highlight

These light fittings use 3D scanning to create the perfect ambience. Take a 360° photo of your room using a phone and stitcher app, and drag and drop into the software. A 3D printer will then produce a unique LED light fitting for you. 3D plans free from [highlight.digital.udk-berlin.de](http://highlight.digital.udk-berlin.de); printing from €250 [shapeways.com](http://shapeways.com)



## Ilia Potemine ISP Lamp

As much an *objet d'art* as a means of illumination, this elegantly proportioned lamp, designed for DCW éditions, is made using highly polished brass and mounted on a solid-marble plinth. There is nothing as predictable as an exposed filament bulb here – the LED light is concealed inside a 37cm tube, which you need to pull from inside the brass cylinder. The resulting effect – part lightsaber, part luxury miner's lamp – is guaranteed to command your guests' attention. £1,085 [madeindesign.com](http://madeindesign.com)



**Ohad Benit Stress Lights**

These handmade lights by Israeli designer Ohad Benit mimic the shapes of soap bubbles being formed. Each item in the collection, named Stress to reflect the tension between the brass rings that hold the mouth-blown bubble glass shapes, is striking. They come in a range of sizes, each supported by a solid-brass tripod frame. £800 [ohadbenit.com](http://ohadbenit.com)

**INTERIORS SPECIAL**

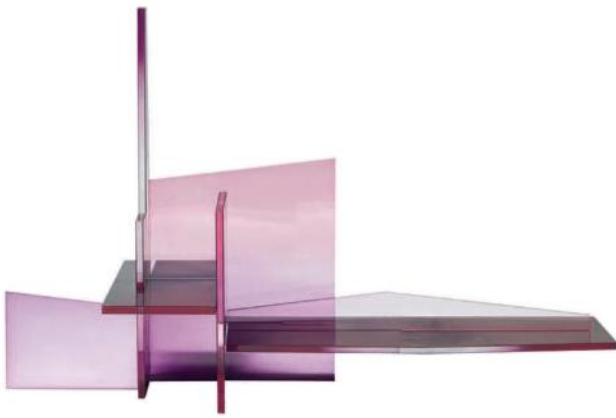


INTERIORS SPECIAL

#### Adriano Design Fuoripista

From its angled handlebars to the fierce stance of its legs, this performs like a luxury exercise bike, but looks like an angry glass bull. Built from tempered glass, expertly crafted solid wood and a smattering of chrome, even the low seat position feels more wildebeest than workout. The classic Brooks saddle ensures your ride will be comfortable. *Out summer 2018 €8,000*  
[adrianodesign.it](http://adrianodesign.it)





### Craft Combine Piece

Part picture, part table, this furniture forms a series of sculptural pieces of jigsaw-inspired wall art. Its pieces can either be mounted in a frame and hung, or slotted together and used as homeware. The range consists of three textural themes: Mountain, constructed from wood, stone and felt; Sea, assembled from aluminium and glass, and City made from solid sheets of acrylic and finished with brass. *Mountain \$800; Sea \$500; City \$1,500* [craftcombine.com](http://craftcombine.com)



### Futurefarms Spacepot

Made from high-clarity acrylic, the Spacepot is where gardening meets rocket science. Using Nasa's hydroponic farming techniques to simplify herb growing, you can cultivate thyme or basil from scratch in five weeks. It's based on the Kratky Method, which requires no soil: just fill the reservoir with water and nutrients, plant your seeds and watch nature do the rest. *\$54* [futurefarms.io](http://futurefarms.io)

### Simon Hasan Wrap

This glassware collection is meticulously constructed from handmade, lab-quality borosilicate glass and wrapped-leather sleeves with brass fittings. The result is a carafe, bottle and decanter that are both beautiful and comfortable to hold. *From £155* [simonhasan.com](http://simonhasan.com)



# Transparent

From a tempered-glass exercise bike to a dichroic table lamp, the smart design and desirability of these items is crystal clear



### John Hogan Hokum Stack

Seattle-based artist John Hogan grew up in Toledo, Ohio, the birthplace of the American studio glass movement, to which he brings a modern look and method. His manipulation of texture, colour and shape, as seen on this kiln-cast and cut-glass sculpture, is intended to attract the eye from every angle. *\$3,600* [johnhogandesigns.com](http://johnhogandesigns.com)



### Trueing Janus

Brooklyn-based design studio Trueing has past form in engineering – as demonstrated in the materials and functionality of this piece. The cosmic-themed table lamp is named after one of Saturn's outermost rings. With an adjustable shade of dichroic glass, which shows different colours when viewed from different angles, the lamp's luminous solid-brass ring shines inwards to create a spectacular aurora. *\$poa* [trueing.co](http://trueing.co)



### Kartell H-Horse by Nendo

This children's plaything by Japanese design studio Nendo for Kartell was inspired by the H-shaped beams used to support structures such as bridges and skyscrapers. This, of course, makes them inherently strong, so by applying this concept to a rocking horse, the design could be formed with minimal material. The result is a ride that weighs just 5kg. Available in minimalist clear and three other hues. *£202* [kartell.com](http://kartell.com)



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## Range Rover Velar

Being a Range Rover, the Velar's off-road capabilities are not in doubt. There's lots of innovation on show – including the Matrix Laser-LED headlights, which can illuminate more than 500m ahead – but the interior is the real star here. Ambient LED lighting can be configured to ten colours, and seats can be customised using Kvadrat's premium cloth. Two 10in HD screens form the Touch Pro Duo, used for infotainment, navigation, climate control and vehicle set-up. Audio-wise, the First Edition model has a 1,600W Meridian Signature Reference System. For storage and streaming, a 60GB hard drive and 4G Wi-Fi should suffice. And an Activity Key wristband means you can leave those pocket-busting keys at home. *From £44,830 [landrover.co.uk](http://landrover.co.uk)*

### INTERIORS SPECIAL

The Velar's perforated-leather seats can be swapped for a more sustainable wool-blend material by Kvadrat

# EAT DISRUPTORS FOR BREAKFAST.

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CREATOR OF A PORTABLE BRAIN SCANNER

**CARRIE GOLDBERG**

THE ATTORNEY FIGHTING SEXUAL TERRORISM

**MARCUS ENGMAN**

IKEA'S DESIGN MASTERMIND



NOV 2-3, 2017

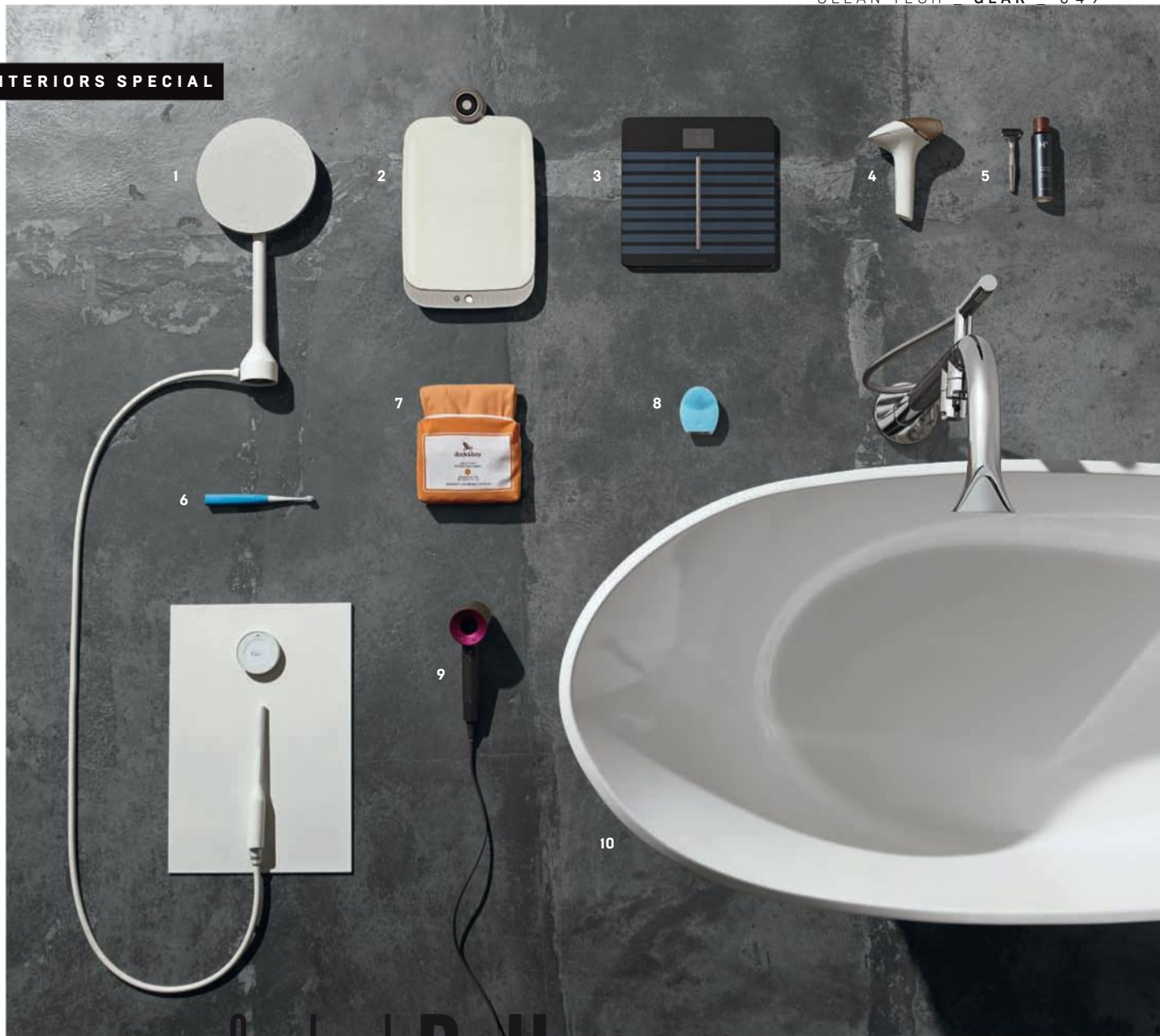
TOBACCO DOCK, LONDON

[WIRED.UK/WIRED-LIVE](http://WIRED.UK/WIRED-LIVE)



## INTERIORS SPECIAL

WORDS: MATT BURGESS. PHOTOGRAPHY: ANDY BARTER



# Gearhead Bathroom

Showering, shaving and brushing your teeth just got a whole lot more stylish

## 1 OAS Indo shower

This shower reuses water by circulating five litres of the wet stuff at a rate of 12 litres per minute. \$3,600 [orbital-systems.com](http://orbital-systems.com)

## 2 HiMirror

This mirror's attached camera detects skin problems and provides advice based on the results. \$149 [himirror.com](http://himirror.com)

## 3 Nokia Body Cardio scale

Nokia's pulse wave velocity technology measures your heart rate, as well as muscle, fat, water and bone mass. £150 [nokia.com](http://nokia.com)

## 4 Philips Lumea Prestige

This IPL hair remover has five settings, so it can be used on your face, as well as the body. £575 [philips.co.uk](http://philips.co.uk)

## 5 The Winston Set

This shaving set, available through shaving company Harry's, comes via subscription starting at £2 per blade. £18 [harrys.com](http://harrys.com)

## 6 Ara smart toothbrush

Weighing just 70g, the Ara electric toothbrush collects data and teaches you correct techniques. €129 [kolibree.com](http://kolibree.com)

## 7 Dock & Bay towels

These suede microfibre towels can fold down to less than half the size of an equivalent cotton one. £14 [dockandbay.co.uk](http://dockandbay.co.uk)

## 8 Luna 2 brush

This sonic facial-cleaning brush claims to reduce forehead wrinkles and tiny lines around the eyes and mouth. £170 [foreo.com](http://foreo.com)

## 9 Dyson Supersonic

Dyson's hairdryer propels 13 litres of air each second. Its head also draws in air to create a high-pressure blow dry. £300 [dyson.co.uk](http://dyson.co.uk)

## 10 Amalfi tub

Made with Quarrycast – volcanic limestone and resin – this bath comes with a 25-year guarantee. £2,380 [vandabaths.com](http://vandabaths.com)

# Living room

From 3D-printed chairs to hackable sofa beds, these innovative designs ensure you'll always be in your comfort zone

## 1 Studio INTEGRATE Rio

In collaboration with London-based Studio INTEGRATE, this chair blends classical upholstery techniques and materials alongside the latest in intricate 3D-printed polyamide. The result is a range made from a mix of solid FSC-certified beech, walnut and oak, plus your choice of fabric, all finished with a sculptural back rest and spindle legs. £2,902 [morganfurniture.co.uk](http://morganfurniture.co.uk)

## 2 Nomess Radar

By settling on an asymmetrical profile for this all-metal table, the Nomess's designers created a product that works equally well at the bedside or perched over the edge of the sofa. It's available in five colours, but WIRED couldn't look beyond cosmic pink. [It's also the perfect size for our back issues.] €295 [nomess.dk](http://nomess.dk)

WORDS: CHRIS HASLAM. PHOTOGRAPHY: ANDY BARTER

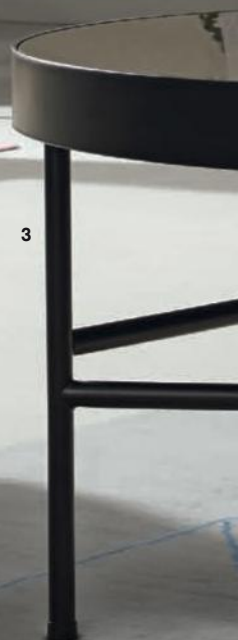


1

2



3





### 3 Ferm Living table

Marble continues to be a key trend in 2017 and this effortless 70cm-diameter side table from Ferm Living proves again just how versatile real stone can be. The perfectly proportioned powder-coated metal frame supports the solid marble top, giving the impression that it doesn't weigh much more than your sofa. £419 [fermliving.com](http://fermliving.com)

### 4 Muuto Loom

This sumptuous hand-woven throw was designed by for Muuto by Swedish textile artist Simon Key Bertman. Made from 100 per cent cotton, it measures 130cm by 180cm and is available in seven colours. Each throw combines on-trend geometric patterns with rich, colourful texture. £74 [muuto.com](http://muuto.com)

### 5 IKEA Delaktig bed sofa

Tom Dixon approached IKEA with a design for a coffin. Although that idea quickly expired, it opened a dialogue between the two houses – and the result is Delaktig. Due in stores in 2018, the groove in the sofa-bed frame has been engineered to accept several third-party accessories including a clip-on side table, privacy screen and mechanism to transform it into a bunk bed. £poa [ikea.com](http://ikea.com)

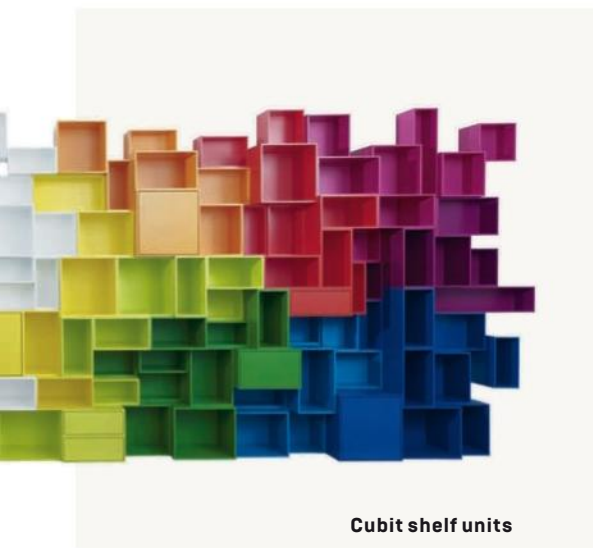
### 6 Loewe Bild 5

Loewe makes handsome televisions, and this is no exception. The Bild 5 blends cutting-edge technology – 55" OLED screen, built-in 5.1 multi-channel decoder for surround sound, HDR and Dolby Vision – with a distinctly retro choice of piano black and a texture-rich solid silver-oak stand. From £2,990 [uk.loewe.tv](http://uk.loewe.tv)

## INTERIORS SPECIAL



ALSO ON PAGE: LOLA JAMES HARPER "THE MUSIC ROOM ON TRUFO STREET" CANDLE; A+ ARCHITECTURE: THE BEST OF ARCHITIZER 2017 (PHAIDON); CALIFORNIA: DESIGNING FREEDOM (PHAIDON); BITTERSWEET BY NOMA BAR (THAMES & HUDSON); HAY PAPER PORCELAIN ESPRESSO CUP & SAUCER

**Cubit shelf units****Köllen bookshelves**

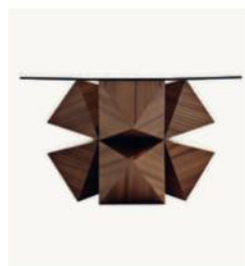
Looking more like a waveform than a piece of furniture, Köllen is a modular beech-plywood bookshelf that begs to be played with. The slotted shapes can either be positioned horizontally as a shelf, or vertically to accommodate tall items. An inverted keyhole slot and metal pole lets you push upwards on the base to unlock the shelf and reposition it. From €350 [kollendesign.com](http://kollendesign.com)



Flexible, modular and endlessly customisable, Cubit's impressive shelving system can be built to fit virtually any space using its simple online design tool. Each MDF box is finished with semi-gloss lacquer in a choice of 27 colours and four real-wood veneers. It comes with wall fixings and an ingenious joining system that ensures they line up perfectly. From £34 [cubit-shop.com](http://cubit-shop.com)

**Desalto Clay table**

Marc Krusin's highly sculptural design boasts a rigid polyurethane base with an MDF top, which is hand-finished in a distinctive lava-stone paste. The side table is available in diameters of 50cm, 60cm or 75cm; colours include matt white, graphite grey, blazing yellow, quartz pink, denim blue and lava stone. From £1,140 [chaplins.co.uk](http://chaplins.co.uk)

**Rasmus Fenhann Pyramid II**

Despite his choice of sturdy American walnut, santos rosewood and glass, Rasmus Fenhann's Pyramid II table was inspired by origami and the synthesis between the Japanese spirit and mathematical beauty. The result is a series of perfectly balanced blocks, with only the faintest of connections highlighting their geometric complexity. [epoa.fenhann.com](http://epoa.fenhann.com)

**Jean Huang LÖV**

Do you have an umbrella stand waiting for a downpour? This design combines a hoop and two simple, suspended pots, which allows you to water plants while your broolly drip-dries. Created by Jean Huang for her final-year project at Central Saint Martins in London, the stand, which also incorporates UV lights to stimulate plant growth, is playful, well executed and strangely practical. [epoa.jean-huang.space](http://epoa.jean-huang.space)



# Furniture

Customise to your heart's content with adaptable bookshelves, a multi-purpose umbrella stand and remouldable chairs

**INTERIORS SPECIAL****Atelier Mendini Alex**

Ecopixel is an extremely practical composite material made from chunks of low-density recycled and recyclable polyethylene. It can withstand temperatures from -10°C to 80°C, making it suitable for both indoor and outdoor use. Unlike many plastics, it can be melted down and reshaped multiple times. Alex by Atelier Mendini is a modern, pointillist-inspired chaise created using a mesh of random ecopixel colours to create a super-light, quick-draining structure – perfect for the British weather. €4,200 [ecopixel.eu](http://ecopixel.eu)





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A

**Alastair Humphreys** describes himself as an adventurer. It's a fitting title, especially given the feats he's achieved and recorded. A former

*National Geographic* Adventurer of the Year, Humphreys has tried a lot. Yet his latest idea might push more boundaries than ever before. After all, microadventures have the power to change the everyday lives of many.

The term "microadventures" was coined by Humphreys, and refers to adventures which are short, simple and local. "The idea came about because I kept hearing from people, 'I'd love to do the sorts of things you do but I can't, because...' and there were lots of regular reasons." He accepts that he is an exception as a full-time adventurer, and to inspire those that aren't means showing what's possible a little closer to home. "What I'm trying to do with microadventures is to say, 'Look, the wilderness is closer than you think.'" Location doesn't matter, Humphreys insists. At its core, microadventures are about trying something new, experimenting.

It's more than just theory. "I've been lucky to go out with people trying their first microadventure, and experimenting is something they've never done before". Such ventures result in "people speaking in hyperbole as the Sun sets, saying 'It's the best thing I've ever done!'". But best doesn't necessarily mean biggest or most far-fetched. "The idea of microadventures grew in popularity the more inclusive I made them. As I made them shorter, simpler and more open to interpretation, there was no excuse not to do them."

Naturally, at the heart of the microadventure concept is a simple, small suggestion: that being alive to exploration and experimentation can bring rich rewards wherever you are. "When I'm driving and I go over a bridge, I always look down and see if the river looks good for swimming or canoeing or camping. Once you get this mindset that there are wild, beautiful places everywhere, adventure seems far more accessible."

Humphreys has vast experience in accessing adventure. At the age of 24, he embarked on a four-year round-the-world

# Experimental series #1: The spirit of microadventure

In our first profile in collaboration with Glenfiddich's Experimental Series we meet Alastair Humphreys, a man on a mission to inspire exploration, citing curiosity as the fuel for human adventure – whether large or small

cycling trip; he's rowed the Atlantic, trekked Iceland's interior unsupported, canoed 800 kilometres down the Yukon river and trekked The Empty Quarter, Earth's largest contiguous sand desert. Yet even with larger adventures, it's the connection with others – the telling of a story that came from trying something different – that drives him. "I quite relish the challenge that an adventure isn't just about me heading off into nature," he says. "I also have to come back with something that resonates with other people."

And microadventures are starting to resonate with people. Humphreys is helping others to unleash their experimental sides and prove that an intrepid mindset isn't the reserve of full-time adventurers. In fact, aside from opportunity,

Humphreys feels that his own ability to try new things is nowhere near exceptional.

"My natural disposition is not particularly bold or experimental. I'm quite a lazy wimp, but over the years of doing adventures large and small I've taught myself to keep trying new stuff. Even when it scares me, seems difficult or a bit of a hassle, it's always worth it," he says. "Once you start doing new things, the world gets infinitely large. I find that very exciting."

That's not to say undesirable things don't happen as well. During the 240km trans-Saharan Marathon des Sables races, Humphreys broke a foot (he still completed the event, finishing among the fastest Britons). It wasn't a pleasant experience, but overcoming difficulties "make the best stories in the long

run, so it's better getting on with it". More importantly, everyone can – and should – experiment in even the smallest ways. "What's the worst that could happen?" he asks. In my everyday life, probably nothing nearly as bad as when I'm crossing the desert." [glenfiddich.com/uk/explore/experimental#ESGlenfiddich](http://glenfiddich.com/uk/explore/experimental#ESGlenfiddich)

**'WHAT I'M REALLY TRYING TO DO WITH MICROADVENTURES IS SAY TO PEOPLE: "LOOK AROUND – THE WILDERNESS IS A LOT CLOSER THAN YOU THINK"'**

**Alastair Humphreys**

GLENFIDDICH

Right: Alastair Humphreys  
photographed by  
WIRED at the Turner  
Contemporary gallery  
in Margate, Kent,  
September 2017







# WIRED Retail

WIRED RETAIL RETURNS THIS MONTH TO GATHER THOSE AT THE FOREFRONT OF CHANGE IN THE INDUSTRY – THE INDIVIDUALS, STARTUPS AND INCUMBENTS – TO EXPLORE THE SECTOR'S FUTURE. THE ONE-DAY EVENT WILL COVER TOPICS AS DIVERSE AS FRICTIONLESS PAYMENTS, VIRTUAL REALITY, 3D PRINTING, DRONE DELIVERY, BLOCKCHAIN AND PERSONALISATION



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**DANIEL MURRAY**  
CO-FOUNDER,  
GRABBLE

• Serial entrepreneur and angel investor Daniel Murray is co-founder of the UK's fastest-growing fashion and lifestyle app *Grabble* and is the host of popular podcast *The Secret Lives of Leaders*.



**JOHN VARY**  
INNOVATION MANAGER,  
JOHN LEWIS

• John Vary leads Room Y, the UK department store's in-house skunkworks. He oversees and leads the creation and development of special projects geared around multi-sensory experiences.



**KIRA RADINSKY**  
CHIEF SCIENTIST  
& DIRECTOR OF DATA  
SCIENCE, EBAY ISRAEL

• Kira Radinsky is a pioneer in predictive analytics. She founded SalesPredict in 2012 and was installed as eBay Israel's director of data science following SalesPredict's acquisition in 2016.



**LEILA MARTINE**  
DIRECTOR, NEW  
DEVICE EXPERIENCES,  
MICROSOFT UK

• Leila Martine is responsible for introducing new and innovative Microsoft products to the UK. One product, the HoloLens, enables new forms of interaction between brand and customer.



**MATTHEW DRINKWATER**  
HEAD OF FASHION  
INNOVATION, LONDON  
COLLEGE OF FASHION

• An award-winning influencer in wearable technology, Matthew Drinkwater creates beautiful wearables which bring augmented and virtual reality into the real world.



PLAY



ILLUSTRATION: PETER BLAKE/SILAS AMOS

## Random acts of artiness

Think you can improve the work of famous artists? SmartStream lets you create one-of-a-kind pieces by tweaking their data

### ART

In 2011, Coca-Cola bottles in Australia had a makeover. The company's Share a Coke campaign, which has since been introduced in more than 80 countries, used a simple trick: replacing "Coca-Cola" with names, song lyrics and holiday destinations. In the US, the customised-bottle campaign is credited with increasing sales by more than two per >

cent. And now the same software that allowed Coca-Cola to customise bottles on a global scale is being put to work by artists. "It effectively shuffles the deck of cards to the amount of randomness that I desire. So it could be swapping colour, type or images," says Silas Amos, a design strategist who has spent the past three years testing the software for potential use as a commercial and artistic tool.

Developed by HP, SmartStream software is able to randomise variable data in graphic images. "It's baking slightly different cakes," Amos says. Take a graphic grid of images, for example. The software could swap the colours, sizes, shapes and arrangement of those elements, creating thousands of subtly or radically different prints – all of them unique.

Working with graphic artists Peter Blake and David Shillinglaw, Amos was able to take their work and randomise certain elements such as the eyes and mouth on a face or the colour and size of a square. "Designers are control freaks, but when the stuff comes back they see it's an interpretation of their intention," he says. "They're typically pleasantly surprised." Letting software do the heavy lifting could soon become a no-brainer. JT [silasamos.com](http://silasamos.com)

Below: Peter Blake's original version of the artwork Silas Amos altered (*previous page*)



# Mean machines

## Real Steel: the real deal

ROBOTS

**MEET MARK. STANDING 4.9 METRES TALL AND** weighing 12 tonnes, it was built by Gui Cavalcanti and Matt Oehrlein to do one thing: destroy other machines. The two engineers are the founders of MegaBots, a company that plans to stage bouts between piloted death mechs in an international fighting-robot league which promises to be a combination of *Monster Trucks* and *Real Steel*.

This iron giant (official name: *Mk. III*) is a metallic menace. "We're designing robots to be badass and entertaining," says MegaBots CEO and Boston Dynamics alum Cavalcanti. "Oh, and we would like to not die in the robot." The first fight, between *Mark* and a mech named *Kuratas*, built by Japan's Suidobashi Heavy Industry, was scheduled to take place in September at an undisclosed location. Missiles were banned for the bout – just hand-to-hand combat. We're sure it was a smashing success. David Ferry [megabots.com](http://megabots.com)

### Arms

*Mark* can carry more than 900kg and has enough power to swing a car three metres in the air.

### Legs

Tank treads serve as feet, and *Mark's* lower half has a 430-horsepower engine driving it.

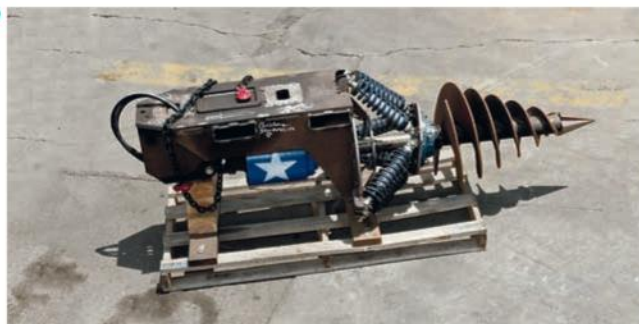
### Weapons

The bot has an interchangeable arsenal for mauling enemy metal while looking totally *Gundam*. Some favourites: a circular saw and a drill auger.

### Cockpit

The safety cage is surrounded by metal armour plating and bulletproof glass, with a rubber damping system to reduce the shock of any impacts.

② The *Mk. III* destroys a Toyota Prius as part of a Kickstarter reward for MegaBots' backers in San Mateo, California









# North Korea's big reveal

Nick Bonner's memorabilia from the reclusive nation has helped to uncover its secret identity

**NICK BONNER HAS VISITED NORTH** Korea once a month for 24 years. When he returns from the isolated state, his suitcase includes items such as beer bottles and tin cans. His collection paints a picture of the country's changing sense of self. "All the designs are hand-drawn; some are quirky, some are cool and some are beautiful," he explains.

UK-born, Beijing-based Bonner's interest in design comes from his architectural background: in 1993, he set up a business in Beijing to help tourists gain access to North Korea and engage with people through cultural, sporting or humanitarian initiatives. He has been collecting North Korean packaging since his first trip; some are items that any traveller could stumble across, others can only be found by exploring the country's more remote parts. "I have postcard sets from the 70s, still in their sleeves, which I found on the bookshelves of a hotel gift shop on the east coast," Bonner says. "The area had received so few tourists that they just remained sitting on display."

An assured Korean style is present in many of the designs, in the form of



DESIGN



the country's natural elements. "To present a landmark - a mountain, building or sculpture, say - on a packet of cigarettes or box of matches is to imbue them with instantly recognisable Korean-ness. This makes them the best, in the eyes of North Korean leaders, even in the absence of any rivalry," Bonner says.

In the early 2000s North Korean graphics transitioned to digital with the introduction of new printing methods. Bonner says companies wanted shiny designs with computer-aided elements and bright colour palettes. "The harbinger of this was the packaging for Korean-made cola, which imitated the familiar red label and tapered-waist bottles of Coca-Cola," he says.

But the typical backlit panels used in western culture to sell shampoo or chocolate is saved for propaganda posters in the capital Pyongyang. "At times they have implied a celebrity endorsement by featuring a photograph of a singer or sportsman on the posters," he says.

Bonner has many favourite pieces of memorabilia, but one that particularly amuses him is a fun design on an Air Koryo sugar sachet. In a society that isn't known for frivolity, he finds it bizarre that they've gone out of their way to decorate something as mundane as a sugar packet. "Even within this most autocratic of systems, there's still a sense of the human touch," he adds. **Bonnie Christian** *Made in North Korea (Phaidon Press) is out now*

Above and left: These cards celebrating the New Year would typically be sent by soldiers to their families or children. Other graphic designs used in adverts for drinks and sweets offer a hint of luxury and a break from daily monotony





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© Benjamin Clementine, whose most recent album *I Tell a Fly* was recorded at London's RAK studios. Earlier this year, he featured on Gorillaz' anti-Trump song "Hallelujah Money"

**PROFILE**





**FOR BENJAMIN CLEMENTINE, NOTHING IS MORE** important than the spoken word. “Language is as powerful as religion and God. Without language we are all bound to fail,” explains the London-born poet and musician.

Clementine won the 2015 Mercury Prize for his debut album *At Least for Now*. He recently released his second album *I Tell a Fly*, the title and theme of which were influenced by an odd bit of bureaucracy. “I got a visa to America and the title was ‘an alien of extraordinary ability’.” It struck me that someone would call someone else an alien,” Clementine, 28, says. “An alien, me, living in America. I felt like a fly, a fly alien who wanted to know more about what was going on.”

Originally intending to stay for just a few weeks on tour, Clementine ended up spending the full two years his visa allowed. “As I lived in America, I started to write about my experiences around that time. There was the refugee crisis, Clinton and Trump, Brexit.” Directly or indirectly, *I Tell a Fly* is an album that tries to grapple with the wider world. “I didn’t want it to be just about me, I wanted it to be about my surroundings and what is happening,” he explains.

Clementine is tall, with improbably high cheekbones and a deep, soft accent that oscillates almost comically between north London and Queen’s English. When he talks, as with when he performs on stage, his choice of words feels considered and deliberate. “Language is such a great thing,” he says, almost childlike in his understated excitement. So great, in fact, that Clementine has spent the past few years working on his own dictionary. “I’m always coming up with new words or seeing new words that I like and giving my own meaning to them. I thought it would take a few months, but it’s taking years. But, I am very ambitious. This is merely an inspiration taken from Ambrose Bierce, who wrote *The Devil’s Dictionary*, writing his own meanings for the words that he loved. I’ve taken the same initiative. I’m writing the words I like and what they mean to me, and putting them in a form where other people can see them.”

Clementine’s rags-to-riches story – from homeless busker on the Paris Metro to breakthrough musical talent – is the stuff of dreams. But, at risk of his story overshadowing his music,

# Music with no labels

Benjamin Clementine is more than a musician – he’s also a lexicographer

Clementine is guarded about his past and disdainful of the attempts made to pigeonhole his talent. “I’m just not interested. This is what we do as humans. We try to understand things by putting them into sections. I understand and accept it, but if someone is being lazy and calls me a soul artist then I get pissed off. Because I’m not,” he says, laughing timidly. “But hopefully, when I’ve done more than just two albums, maybe they will put me in a place where I deserve to be.”

Clementine’s influences range from Leonard Cohen to William Blake and Luciano Pavarotti. “I’ve embraced all of them,” he says. “Some people call me Nina Simone, which I hate. Other people will call me... what’s he called? Tom Waits, who I love.” Clementine might have a reputation for being a storyteller, but that is also a label he doesn’t feel comfortable with. “These are titles put upon artists,” he says with a weary edge to his voice. “I would refer to myself as an artist. But obviously, firstly, I’m Benjamin. I don’t see how I am a storyteller. But if it’s because I write stories, then so be it.”

Like his debut album, Clementine’s latest release defies categorisation. It’s melodic and erratic, jumping from stripped-back piano ballads to soaring, complex compositions. All the while, his lyrics and voice come to the fore. “I’ve fought to be more expressive in my music and to be more... I wouldn’t say free, because freedom for me is just a word,” he says, pausing thoughtfully. “The songs are more musical. I spent a lot of time composing, trying to make an actual composition rather than just playing one chord and then singing a song. I used the harpsichord. I grew up listening to a lot of classical music, but it’s also an instrument that, for me, represents Europe. I thought it was vital that I used original, classical instruments to tell my story.”

Clementine compares the emotion behind his second album to a child becoming aware of the complexity of the world around them. “You learn. You’re less ignorant, you’re less naïve. And you try to understand people’s reasons for doing certain things. I wouldn’t call it an angry protest. I am not a politician. I am merely an artist.” **JT** [benjaminclémentine.com](http://benjaminclémentine.com)

**‘You learn. You’re less ignorant. And you try to understand people’s reasons for doing things. I wouldn’t call it an angry protest’**



#### Digital extra!

Download the WIRED app to view a Benjamin Clementine video



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**LEYLA HUSSEIN**  
LEAD SOCIAL  
ACTIVIST, WRITER AND  
PSYCHOTHERAPIST,  
DAHLIA PROJECT

Hussein helped found Dahlia Project, the UK's first specialist therapeutic service for FGM survivors, and Daughters of Eve, a charity dedicated to ending gender-based violence.



**MAGGIE ADERIN-  
POCOCK**  
SPACE SCIENTIST

Maggie Aderin-Pocock MBE is a space scientist who has worked on many out-of-this-world projects. She is also a popular science communicator and is perhaps best-known for presenting astronomy show *The Sky at Night*.



**SILAS ADEKUNLE**  
CO-FOUNDER AND  
CEO, REACH ROBOTICS

Adekunle blends biology, video games and robotics through Reach Robotics. His MekaMon gaming platform combines advanced robots with video games, via augmented-reality gameplay controlled by smartphones.



# From bricks to flicks: how LEGO builds its blockbusters

The company's senior creative director on how he moved the brand into the virtual world

**F**or Simon Lucas, nothing is more important than the integrity of the brick. As senior creative director at LEGO, Lucas marshals the company's wealth of products and films, ensuring that everything looks and behaves exactly as it should. Following the double-whammy success of *The LEGO Movie* and *The LEGO Batman Movie*, he's hoping that *The LEGO Ninjago Movie*, released on October 13, will give the company a cinematic hat-trick. The latest LEGO film is an evolution of the TV series that Lucas has overseen since 2012, but now with added Jackie Chan. WIRED sat down with Lucas to find out how bricks and pixels share the same DNA. Alex Godfrey



Simon Lucas visualised as a LEGO mini figure for WIRED

## PROFILE

makes sense from a story point of view. The film-makers wanted to open the movie with the ninja not being so ninja, using technology, mechs and machinery to save the city. So we started to think about what the mechs and machinery looked like. We invited the director and production designer to Denmark and spent a week doing what we call a design boost. We got several LEGO designers together and asked them: "We know that Kai needs a fire-mech in the scene – what does that look like? What's the functionality?" And then we sketched in the LEGO bricks.

**'Because there's so much detail on screen, it's pushed us in a great way'**

### Do you sometimes tell film-makers what they can and cannot do?

We have a lot of technical rules. We want it to look like it's real LEGO, so we'll provide a studio with the design of how it will look if we did it. We have lots of adult LEGO fans as well and they pick up on the details. They will know if you can't print that way on a brick. I like to think that everything in the movies is buildable.

### The Ninjago City play set has 4,867 pieces. How accurately does it reflect what's in the film?

Ninjago City in the movie is huge. If we counted the bricks, we'd be talking millions. You can't do a set that big. So we thought it would be fun to do a slice of Ninjago City, the best bits in one big model. Because there's so much detail on-screen, it's pushed us in a great way. When I look at all the toys for the movie, the detail, the size, the build complexity – it's a whole other level of awesomeness.

### WIRED: Why do you think the visual style of LEGO films has been so well received?

**Simon Lucas:** For an older audience there's something nostalgic. A lot of people have grown up with LEGO. And somehow jokes are taken to a whole other level when you see them brought to life in LEGO. When we develop these movies, we see storyboards and maybe the joke is funny. As soon as it's animated into LEGO though, it just takes on a new charm. Everything in the first movie is LEGO. If you had all the bricks in the world you could recreate that movie. We do it digitally, obviously, but that's the promise – that this is all real LEGO. That remains true in *The LEGO Ninjago Movie* too.

### How do you ensure that everything that appears in the films stays true to LEGO's heritage?

It's so important that it's not product placement. We have a really strong collaboration to figure out what

A three-person submersible explored the Antarctic Ocean to depths of 1,000 metres



# A deeper dive into the blue

The technical hacks in the second series of *Blue Planet* reach new heights – and depths

Enlisting a killer whale as a camera operator is a big ask. But for the crew of the BBC's *Blue Planet II*, it was just another problem to solve. The team of filmmakers and scientists spent two-and-a-half years armed with a camera on a suction cup in pursuit of orcas feeding in the Norwegian fjords. Working within a four-hour window of daylight over four weeks a year, the team finally got the footage, which is one of the highlights of the new series. "We made life harder for ourselves by doing it

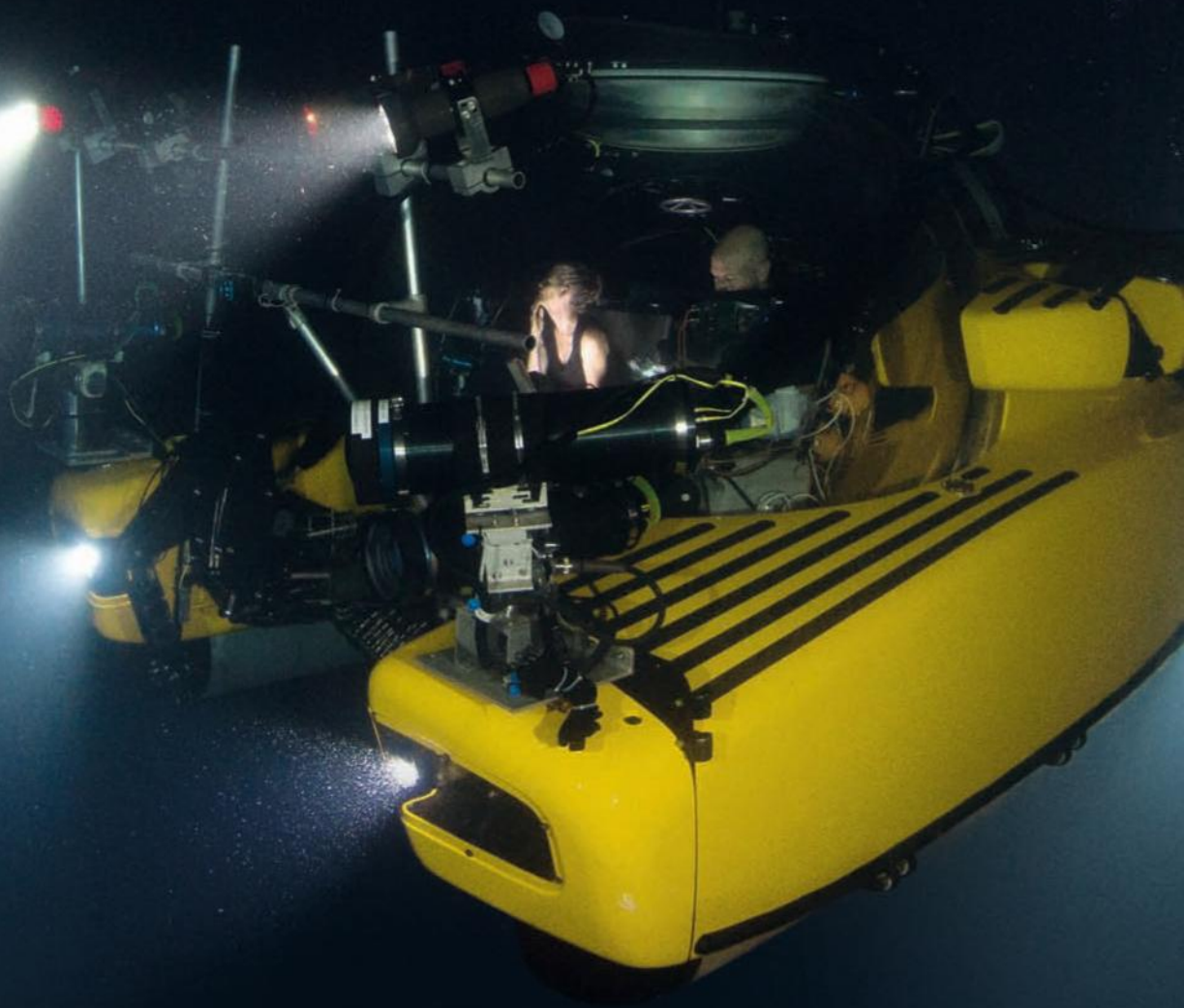
unobtrusively," says show producer Jonathan Smith. "But the result was we could start to unravel the orca's behaviour."

Like the original series from 2001, *Blue Planet II* is narrated by David Attenborough and uses ingenious hacks to reveal untold stories. For one episode, a team spent 1,000 hours in a submersible to capture new landscapes.

"We develop technologies in pursuit of what we want," says executive producer James Honeyborne.

When it came to filming killer whales, the crew devised one of its most audacious shoots. Word reached them that the orcas had developed a technique to help them catch herring. They would herd the fish into tight balls and flick their tails to create sonic shockwaves. The stunned fish could then be picked off and eaten.

To create the suction cameras, the *Blue Planet*





## TELEVISION

turned his attention to female walrus – and the lengths they go to when looking for the right iceberg to rest their calves on. To show the animals at work, the team wanted to film what was happening above and below the water's surface simultaneously. In order to avoid refractions through the sea and the air showing up in the image, they built a 60cm "mega-dome" they could place in front of the camera. "It was an absolute beast," Smith says. Once placed in the water, the next issue was preventing splashes from ruining the upper half of the shot. "We had to find the perfect way to keep the top slippery so the water ran off it," says Smith.

It took a crew of 11 three weeks to capture footage of the walrus and her calf on an iceberg near Kvitøya while showing the ice beneath the surface at the same time. "Trying to do this in freezing water with a huge animal that can get a little testy at times... the challenge was extraordinary," Smith says. "We might consider the walrus a big monster of an

The team attempts to place a camera on an orca



animal, but we revealed the most caring mum in the animal kingdom."

All this new footage doesn't just make for great TV – it's also helping science. Twelve scientific papers are due to be published as a result of *Blue Planet II*. "There's a dynamic emerging between the scientific community and ourselves," says Honeyborne. The series also paints a vivid portrait of the environment, from coral bleaching to the impact of marine plastics and the break-up of icebergs.

For Honeyborne, the evolving story of our oceans and the discoveries being made makes a third season an inevitability. "We still know so little about the deep sea," he says. "We know more about the surface of Mars than we do about the seas of our own planet." **Bonnie Christian** *Blue Planet II will be shown on BBC One and the BBC iPlayer this autumn*



## Secrets from the sea shoot

**The *Blue Planet II* team spent five years documenting the ocean's untold stories – a task executive producer James Honeyborne says required them to create and build their own equipment to capture the shots they wanted. Here are some of the team's hacks.**

### LOW-LIGHT CAMERAS

-

As shoals of mobula rays gathered off the Mexican coast, the team used ultra light-sensitive cameras to capture the *Noctiluca scintillans*, or sea sparkles, that light up with the rays' wing beats. "We had never filmed them at night before," says Honeyborne, "It was like a Disney film."



### DRONES

-

The team heard from local fishermen that sea lions in the Galapagos were driving yellowfin tuna from the open ocean into coves, forcing them to beach. Using drones, Honeyborne and the crew were able to capture the hunt. "We saw the complete story for the first time," he says.



### UNDERWATER MOTION-CONTROL TIME-LAPSE RIG

-

Filming a time-lapse underwater is much more challenging than on dry land. The team built their own motion-controlled rig to do this. "We were able to film in and under rock pools and on bleaching coral in a way that really brings it to life," says Honeyborne. **BC**



team worked with two scientists from the Norwegian Orca Survey. The cameras were fitted with sensors that recorded speed, temperature, salinity, duration and location (they were designed to fall off after a few days). Attaching the cameras in the first place, though, was an arduous task. Armed with poles, scientists would sneak up on feeding orcas and place them on their backs when they came to the surface.

With their new crew members on board, Smith



# WIRED Energy

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**LAWRENCE ORSINI**  
CEO AND FOUNDER,  
LO3 ENERGY

Lawrence Orsini helped to establish the Brooklyn Microgrid, New York's peer-to-peer energy market for the generation and trading of solar power by local businesses.



**JOANNA HUBBARD**  
COO & CO-FOUNDER,  
ELECTRON

Blockchain startup Electron is developing an energy platform using distributed ledger technology, allowing for more efficient, resilient and transparent energy use.



**NINA BHATIA**  
MD, CENTRICA  
CONNECTED HOME

Bhatia is responsible for the Hive brand, focusing on developing smart-home products and services that are accessible to everyone in the UK, Ireland and North America.



**HUGO SPOWERS**  
COMPANY ARCHITECT,  
RIVERSIMPLE

UK-based automotive startup Riversimple is testing the Rasa, its first hydrogen fuel-cell-powered vehicle. The two-seater car's monocoque chassis weighs less than 40kg.



**MARJAN VAN AUBEL**  
DESIGNER AND  
FOUNDER, CAVENTOU

Amsterdam-based van Aubel created the Current Table and Current Window. Through her startup Caventou, she works on making sustainability beautiful.

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**Timber towers are branching out** around the world. Designed to trap thousands of tonnes of carbon within their walls, wooden skyscrapers are more than just architectural statements – they're monoliths of modern environmentalism.

"I can hold the number of tree seeds it took to build **Murray Grove** in my palm," says Andrew Waugh, of Waugh Thistleton Architects. His flagship timber build in Hackney, London, completed in 2008, is nine storeys high and constructed entirely from cross-laminated timber (CLT). This wood is a natural storage source for CO<sub>2</sub> and was harvested from a sustainable forest. Once shaped into timber panels, it was assembled on site with cordless screwdrivers, with no need for hammers or toxic chemicals – slotting into place like a giant honeycomb.

The timber boom started from tiny seeds, but it's now starting to take root. A report by the Council on Tall Buildings and Urban Habitat

# Spruced-up skyscrapers

Wooden tower blocks are proving a growth area in an industry dominated by concrete and steel

## TREND DECODER

found that 21 such structures with a height of more than 50 metres will be completed by 2019. "People want to be connected to nature, even when they're indoors," says Philip Vivian, director of design firm Bates Smart. "It's funny, because before we built using concrete and steel, we used wood." His project, the nine-storey

**25 King** building in Brisbane, Australia, is set for completion in 2018. "Research predicts that if we used mass timber in place of concrete and steel, we could cut global emissions by up to 31 per cent."

In Bergen, Norway, **TREET** ("tree" in Norwegian) was assembled in 2015, "almost like building with LEGO", says the company's chief project manager Ole Herbrand Kleppe. Its 62 apartments were designed as prefabricated modules.

As with the other timber towers on this page, TREET's wood is made more resistant to wind and fire thanks to a protective layer of glulam (glue-laminated timber) and fire-retardant lacquer. Goodbye concrete brutalism, hello urban jungle... **Alexandra Simon-Lewis**

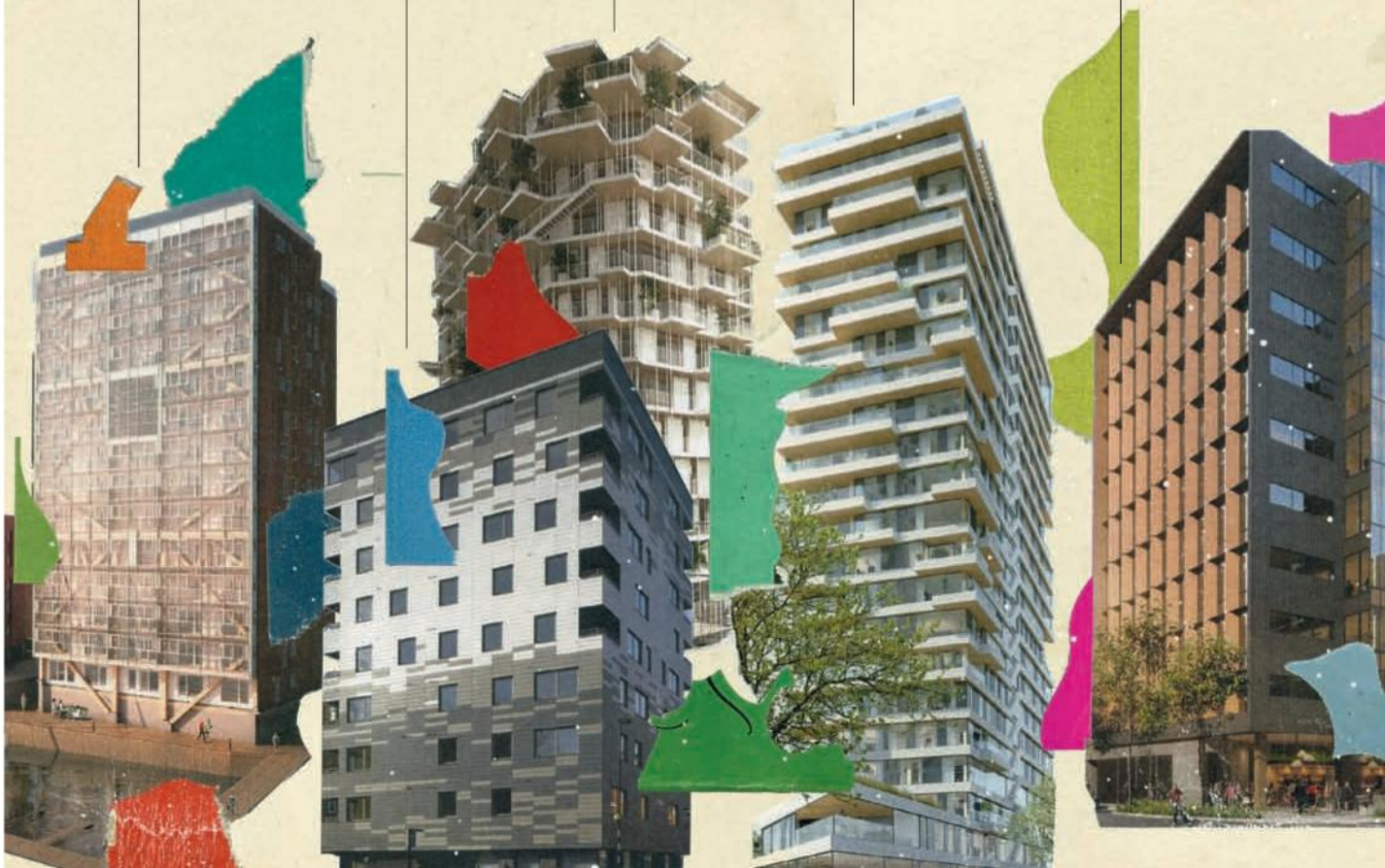
**TREET, Norway**  
Height: 14 storeys  
Completed: 2015  
TREET's glulam-treated blocks are built to resist up to 90 minutes of sustained fire damage.

**MURRAY GROVE, UK**  
Height: nine storeys  
Completed: 2008  
The first urban housing project to be made entirely from timber. Even the lift shafts are made from wood.

**CANOPIA 1, France**  
Height: 17 storeys  
Completed: tbc  
One of the tallest planned wooden buildings in Europe, Canopia 1 will have connected walkways and rooftop gardens.

**HAUT, the Netherlands**  
Height: 22 storeys  
Completed: due 2019  
This timber tower will be the world's tallest on completion and will store three million kilos of carbon.

**25 KING, Australia**  
Height: nine storeys  
Completed: due 2018  
Architects used timber "to promote a comforting and natural environment for its residents".





H

alfway along City Road, the thread between London's Silicon Roundabout and Angel, stands Canaletto Tower.

A dashing 31-floor creation, the building draws the eye and holds instant allure. Its curved metal and glass façade frames apartment clusters its architects UNStudio describe as "neighbourhoods in the sky" – and those neighbourhoods are excelling.

Canaletto has a sense of a community fostered by those living within. Most of the tower's 190 apartments are now occupied, but there is still availability. "We have five Beaumont apartments left," says Canaletto's head of sales Sam Jadavji. "They start at £3.2 million, going up to £3.5 million, and two

Ranelagh apartments starting at £2 million."

The Beaumont Collection comprises three-bedroom sub-penthouse apartments. Situated at the top of Canaletto, they are enlivened by stunning views north and south. Whether it's London's landmarks or the Hampstead Heights, the apartments have more than commanding views in common. Each offers true luxury living beneath high ceilings, and in large, naturally lit living areas enhanced by seamless inside-outside transitions. Bi-folding doors reveal relaxing balcony areas, with custom rails and plate-glass guards ensuring uninterrupted views whether sitting or standing. It's an approach that's mirrored in the apartments' bedrooms: residents can enjoy a clear outside view, wherever they are.

Perhaps the most impressive aspect is the space afforded to the Beaumont apartments

inside and out. "There's 29 square metres of outside space", explains Jadavji, "which is inclusive of the nine-square-metre master bedroom terrace." Such areas make the Beaumont Collection a desirable place to live, as do the many nuances layered upon top-tier floorplans and apartment design. From a technological perspective, fibre-optic internet, AV connectivity, lighting, climate and music control are all present. "The apartments are all fully controlled by the Crestron system," says Jadavji. "With each purchase you receive an iPad, which allows you to control the system from anywhere in the apartment."

There are added entertainment options, too. Jadavji tells of a couple who "like to use the space within their apartment for their own day-to-day downtime". However, when he has friends over for a games night, it's





Canaletto's cinema which plays host. "It's a beautiful use of that side of the building." True to Canaletto's luxury tag, the tower's facilities deliver the pinnacle of innovation and design: its swimming pool on the lower ground floor level uses natural illumination from a cutaway light well.

Yet it is residential life in the tower on which Canaletto's focus remains. Be it socialising at the 24th floor Club Canaletto or in the residents' lounge, the sense is that luxury living should never be solitary. It's a virtue of Canaletto that Jadavji is keen to extol: "The thought behind tower living is that you don't have the space because it's all very clinical – you go into your apartment and that's it. Whereas living on streets and in houses you can speak to your neighbours – here, there are spaces to do that." [canalettolondon.com](http://canalettolondon.com)

# Canaletto Tower: a community living the high life

In the heart of London, a 31-storey apartment block offers residents quality apartments, world-beating views, concierge service and even a private cinema

**Pictured: Natural stone and timber combine with advanced-level home-automation services and appliances**



## LUXURY FEATURES



### Architecture

Designed by Dutch architects UNStudio, Canaletto Tower is highly energy efficient. Its façade bands reflect or deflect UVA or UVB light depending on the season.



### Facilities

Canaletto's residents can make use of a 15-seat cinema, the private Club Canaletto, lounge, gym, sauna, steam room, swimming pool, treatment rooms and a jacuzzi.



### Service

A 24-hour hotel-style concierge service is available for residents. They can help arrange housekeeping, domestic services, book tickets and make reservations.



### Views

The 01-type Beaumont apartments face the City of London. The 02-type have a north-facing canal view with leisurely views across parkland and green spaces.



## #makethefuture **BRING THE LIGHT**

Shell #makethefuture shows how one idea can change the world, but it takes all of us to make it happen

**W**hen entrepreneur Henrique Drumond (pictured right) headed home to Brazil after travelling the world, he knew he couldn't return to work as usual. "I already knew that I would not be able to readapt professionally in a traditional company," he says. "Nor did I find a social organisation that reflected what I was looking for. Founding something new seemed to me the most natural way to move forward."

Insolar was born from that need. Drumond's startup is dedicated to bringing solar power to low-income families in Brazil. The social goal was inspired by his volunteer work in Mozambique using technology to help improve people's lives, while he turned to solar energy in part thanks to his father. "My interest in solar technology must have been inherited from my father, who was an engineer," Drumond says. "It was from him that I also inherited a photovoltaic-powered wristwatch."

Inspired by his travels and the timepiece on his wrist, Drumond had a goal. In his own words, it was "to democratise access to solar energy in Brazil, empowering low-income communities to generate their own energy from the Sun."

Brazil is the ideal place for solar technology. In Rio de Janeiro alone, 1.4 million residents live in favelas with expensive, unreliable power, but across the country solar power makes up only 0.02 per cent of the energy mix, despite Brazil attracting 2,000 hours of sunshine annually.

### **HELP MAKING THE FUTURE**

Having the right idea – and plenty of sunshine – is not enough to guarantee success, of course. To help reach his goal of bringing solar power to Brazilian families, Drumond received a boost from two of Shell's startup-supporting programmes. The first was Iniciativa Jovem, the Brazilian









version of Shell's LiveWIRE programme, which Drumond won in 2014. Now in its 35th year, LiveWIRE helps socially minded startups scale by linking up entrepreneurs, offering business support and contributing funding to local projects in countries where Shell operates.

Insolar also had a "big step forward" thanks to Shell's #makethefuture Accelerator, Drumond says, with 100 entrepreneurs and The Founders Forum consultancy helping to perfect Insolar's business plan, addressing both the commercial and social sides. Now, Insolar offers end-to-end commercial-grade solar installations to corporations, funnelling a portion of the profits to the Insolar Fund, which subsidises smaller solar projects in low-income communities.

"Then, Shell offered Insolar the opportunity to deliver a major project that could benefit a whole community in Rio de Janeiro that incorporated most of the insights we received from the entrepreneurs that attended the launch event," Drumond says.

#### SUNNY SANTA MARTA

Drumond's project is based in Santa Marta, a favela in Rio de Janeiro that's home to 5,000 people who face unreliable, expensive power supplies – but enjoy year-round sunshine. Insolar's mission was to install 150 photovoltaic panels across the favela, generating 185,000 days of low-cost power over 25 years for families and community organisations, including all four of its nurseries, letting them spend money normally allocated to energy on the children. The local samba school was also given solar panels, making it the first dance school in Brazil to convert the Sun's energy into "the energy of Brazilian samba".

Solar was chosen not only because it's renewable and Santa Marta has remarkably sunny weather, but also because it changes how a community looks at power. "By offering our planet much more energy than we need, it fosters a more collaborative society," Drumond says. "By looking at all

corners of the world, it favours the development of local economies in a decentralised way."

Indeed, Shell and Insolar wanted the solar-panel installation in Rio to last well into the future, rather than be left as soon as the cameras turned away. So, alongside helping nurseries, samba schools and families with their power bills, Insolar also trained local citizens to install and maintain the infrastructure. Training was such a success that Insolar added an extra 40 panels.

Solar panels can last up to 30 years, offering renewable energy for decades after installation – but they do require maintenance. "During the Shell #makethefuture

project, we trained 35 Santa Marta residents in electric and solar installation, safety work and working at heights," Drumond says. "The training offered the locals the opportunity to install panels in the majority of Santa Marta community spaces, such as nurseries, NGOs, sport centres and samba school. Moreover, they received 'Insolar Ambassador' titles and all the necessary certificates to work in the electric and solar fields. Some of them started their own businesses, found a quality job, or returned to school."

Insolar's ideas of sustainability and community are at the core of Shell's #makethefuture programme, which kicked



**'THE FACT THAT IT WAS LAUNCHED IN SANTA MARTA, WHERE INSOLAR DELIVERED A MAJOR PROJECT IN COLLABORATION WITH SHELL, HELPED BRING VISIBILITY TO INSOLAR AND OUR SOCIAL MISSION'**

**Henrique Drumond, CEO, Insolar**

**Pictured: Insolar CEO Henrique Drumond in Rio de Janeiro**



off in 2014 with Pavegen's Brazilian project. That startup created the world's first kinetic and solar-powered football pitch in Rio de Janeiro, highlighting #makethefuture's goal of taking bright energy ideas and putting them into action in the real world – a mission that Insolar fits perfectly, says Malena Cutuli, group head of integrated brand communications and capability at Shell.

"The Insolar project is not just about utilising an abundant natural resource, it is also about collaborating with the local community to help create a long-lasting solution," Cutuli says. "At its heart, this is what the Shell #makethefuture campaign is about: working together to develop solutions and initiatives that will help bring about more and cleaner energy for communities around the world."

### BRINGING INSOLAR TO THE WORLD

The Insolar project didn't stop with solar panels in Santa Marta. Drumond toured with #makethefuture festivals, launching the company's solar umbrella, which supplies shade while generating energy to charge devices.

As part of Shell's #makethefuture campaign, Insolar further expanded its

## 'THE INSOLAR PROJECT IS NOT JUST ABOUT UTILISING AN ABUNDANT NATURAL RESOURCE, IT IS ABOUT COLLABORATING WITH THE LOCAL COMMUNITY TO HELP CREATE A LONG-LASTING SOLUTION'

**Malena Cutuli, group head of integrated brand communications and capability, Shell**

reach via the "Best Day of my Life" music video, starring Jennifer Hudson, Pixie Lott, Steve Aoki, Yemi Alade, Tan WeiWei and Brazilian artist Luan Santana. The video has topped 816 million online views.

"The fact that it was launched in Santa Marta, where Insolar delivered a major solar project in collaboration with Shell, certainly helped bring visibility to Insolar and to our social mission," Drumond says.

Insolar received an extra boost from Luan Santana, a popular Brazilian singer with a huge social-media following. "I'm committed to make my voice echo Shell and the entrepreneurs' social action," he says. "Music produces an exchange of energy between audience and artist; I hope that

#makethefuture rocks the five continents as it takes its energy relay around the world."

Santana donates a percentage of the proceeds of his CD and DVD sales to projects such as Insolar, which supported the launch of the Insolar Institute. This will work with the startup to benefit social projects.

"As a social business, we work in the intersection between these two still-separate worlds," Drumond says. "But as the concept evolves in Brazil, we expect to merge both structures, LTD and NGO, and operate with a single structure, setting up a benchmark of how we envision profit and social impact working together in the construction of a prosperous economy and society. It's a win-win deal." #makethefuture

### INSOLAR'S POWER PLAN



#### Inception

Henrique Drumond came back from his travels wanting to make a difference – but found he needed to launch his own startup to realise his dream of giving solar power to low-income families.



#### Shell LiveWIRE

In 2014, Insolar won Iniciativa Jovem, Shell's LiveWIRE programme in Brazil, giving Drumond expert assistance in building a business plan and introducing him to a network for fellow socially minded entrepreneurs.



#### Shell #makethefuture

The next step was Shell's #makethefuture accelerator, which saw 100 entrepreneurs and The Founders Forum analyse Insolar's challenges and propose solutions. This helped to perfect his business plan to include both commercial and social sides.



#### Collaborating with Shell

Plan perfected, Insolar trialled its ideas in Santa Marta, a favela in Rio de Janeiro that lacks a reliable energy supply for its 5,000 residents. The test run saw 150 photovoltaic panels installed across family homes and community organisations.



#### Launching to the world

Shell helped spread the word about Insolar to the world via its #makethefuture festivals as well the "Best Day of my Life" music video, which highlighted the solar startup to millions of viewers.



**The Fundsmith Emerging Equities Trust (FEET) research team searches the world to find companies that make their money from a large number of everyday, repeat, predictable transactions and will benefit from the rise of the consumer in developing economies.**

For example, Indofood sold 9 billion packets of Indomie noodles last year, Magnit welcomed 11 million shoppers a day, MercadoLibre sold over 50 million items on its website last quarter and Dabur's Hajmola tablets were taken 26 million times a day in India.

**You may never have heard of them, despite their scale, but all can be found in the FEET portfolio.**

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#### **FEET Performance, % Total Return**

| Year ending 31 <sup>st</sup> August | 2017 | 2016  | 2015  | Since inception |
|-------------------------------------|------|-------|-------|-----------------|
| FEET Share Price                    | +3.6 | +21.5 | -16.2 | +15.5           |

Source: Financial Express Analytics.

[www.feetplc.co.uk](http://www.feetplc.co.uk)

**Fundsmith**  
Emerging Equities Trust



# WORK SMARTER

Serial entrepreneur and angel investor Sherry Coutu discusses her business secrets with WIRED – and offers tips for maintaining a healthy work-life balance



Fitness challenges, financial guidance and mindfulness sessions are the fastest-growing well-being initiatives to be implemented by UK companies, according to a study by the Reward and Employee Benefits Association.

## PRODUCTIVITY

### Sherry Coutu

Angel investor;  
founder and CEO,  
Founders4Schools

She doesn't court the spotlight, but Sherry Coutu has quietly forged a reputation as one of the UK's leading performers in tech. The 53-year-old Canadian first made a splash with her financial-services platform **Interactive Investor**, which she founded in 1994 and sold in 2001. Since then, she has worked as an angel investor, backing more than 50 companies including **LoveFilm** and **Zoopla**. She's also served on the board of the London Stock Exchange, the advisory board of **LinkedIn** and the finance committee of the University of Cambridge. Her latest venture, **Founders4Schools**, is an online platform which aims to inspire students by connecting them with local entrepreneurs. Here, she discusses her working life. **Charlie Burton**

**"I live in Cambridge, so I try to be in London no more than three days a week.** On Mondays I like to be in London to talk to chief executives face-to-face. Friday's a Cambridge day, but the rest are a hotchpotch. If it's a London day, I wake up at 6.00am and take my son to the station for 7.10am. He gets his train and I get mine. I work on the train; it's a good time for me to work, because it's just about an hour solid and I can get through stuff without any interruptions. I like dealing with emails and I often read something that I've been saving. I'm then at the office for 8.10am. That means I have spent a bit of time with my son and that I can have about an hour before other people come into the office."

**"I've got a rule:** 20 out of 30 nights I've got to be home by 6pm. I have three kids and a husband, and I want to be there with them. I introduced the rule for myself about ten years ago. Life had been quite hectic – and if you don't decide that you are going to be at home for a certain amount of time, you'll find yourself never there."

**"My executive assistant Helena tells me I have 60 meetings a week.** We schedule time in the day to prepare for those meetings and I like to let the person know beforehand what we're planning, or find out what they want. I don't just do coffee. I always make notes in my notebook – I've already written nine pages in it today – and I go through them afterwards. Friday is often a mop-up day: making sure that all of the actions from the meetings that I've had have either been delegated to someone else to follow up, or I've followed up myself. Otherwise you lose the plot. For probably 25 years now, I have been on an 'I don't work at weekends' regime – until about 9pm on Sunday, when I begin to map out the week ahead and familiarise myself with what I am doing."

**"When I'm on my Cambridge days, that's when I exercise.** Swimming is my thing. It's when I have the opportunity to think through things – though I don't necessarily know what's on my mind until I get in the pool."

**"My life changed a few years ago.** When I found out I was pregnant with my third child, I was persuaded that the right course would be to consider being an angel investor, as being a CEO is not particularly compatible with having children. It is beautifully flexible – and intellectually, it's like being in a candy store."

ILLUSTRATION: KRISTINA COLLANTES

## Q & A

### Describe your nightly wind-down routine

"I have an evening wind-down routine of stretching and strength, that sort of thing. I find that it's really good for me because it means my mind is calm."

### Which apps help you to be more productive?

"I could not live without **CalenGoo**. Google Calendar is crap. But **CalenGoo** is an app someone else created to allow you to navigate Google Calendar. It is really amazing. I probably use it at least 20 times a day."

### Do you have a regular email hack?

"No, I don't have a hack, but I do have a one-touch approach to my email – I rarely say, 'I'll think about that later'. I see it, and I either do it or I flip it off to somebody else and keep track of it from there."

### What's your best habit?

"I like talking through things with other people. I really believe that a problem shared is a problem halved. People have helped me come to the most extraordinary solutions that I wouldn't have thought of myself, and I love that."





Green-certified offices could help your cognitive function, leave you with fewer symptoms of sick building syndrome and help you sleep better, according to a study on the impact of green buildings.

## 'My advice to my younger self would be, rather than stay with something you're not thriving at, move on'

**"Founders4Schools came out of the desire to solve a problem:** why don't more students think about careers in starting and growing businesses? In schools, we found that bringing together business leaders and kids could be really profound. It was as if they were given permission to dream and hope. For the project, I draw on the same principles that underpin my businesses. I'm a very data-driven person – I did degrees in political science, econometrics and then business – so as an entrepreneur and investor it's always about trends. With Founders4Schools, our algorithms look at labour-market adjustments and inform the teachers where the skills gaps are going to be. They also inform them which entrepreneur can talk about that in their class tomorrow."

**"If I had any advice to my younger self,** it would be that it is worse to stay with something you're not thriving at than to move on. Of course, it may be frightening to move on because you're jumping into the unknown, but for me the unknown has always been pretty good."

### ...and your worst?

"I'm pretty intense. That intensity can be exhausting for some people because I'm very straight and I don't necessarily realise how sensitive an audience might be. If I have a bad habit, it's making assumptions that haven't been validated."

## BIG QUESTION

## HOW DO YOU RECRUIT AND RETAIN THE BEST TEAM POSSIBLE?



**Rich Pierson**  
Co-founder and CEO, Headspace

—  
"Hire for values: a selfless drive, curious mind and courageous heart. I also look for vulnerability. I ask people: 'What's the best [work] relationship you have ever had?' and, 'The worst?' Both questions allow you to see how vulnerable someone is willing to be, and what they've learned from difficult experiences."



**Natalie Campbell**  
Co-founder, A Very Good Company

—  
"You need a culture that means you can actively recruit and retain the best talent. Ask: do we have a positive company culture, one that values creativity, agility and collaboration? Are we a thought-diverse and interesting company? One that people would want to work for? Do we have clear company leadership and vision?"



**Jeff Lawson**  
Co-founder and CEO, Twilio

—  
"You have to identify and articulate your company values. At Twilio, our values describe how we make decisions, build our products and treat our customers. When we look to hire new staff, our nine values serve as the guiding principles. We look for candidates who have the capacity to live those values."



**Chika Uwazie**  
Founder and CEO, TalentBase

—  
"Hiring an amazing team is important, especially for a startup. We make sure they not only have the right skills but also fit into our culture. We may ask them a question such as, 'If you saw a lion in the room, what would you do?' We want to make sure that they will come up with an answer that goes against the grain."



**Barbara Belvisi**  
Co-founder and managing partner, Hardware Club

—  
"First, acknowledge your weaknesses, look for talent and always hire people that are better than you at executing a task. Choose positive people with good energy and dynamics over too-opportunistic profiles that, on paper, look best qualified. It's about finding people that will get along together." **BC**

**IN THE 90S, NEIL RIMER RETURNED FROM THE US** to Geneva to help his father Gerald exit his Swiss-bond-trading firm, Index Securities. He spotted the fledgling European startup scene and, in 1996, founded Index Ventures with his brother David and ex-McKinsey & Company consultant Giuseppe Zocco – long before most Europeans understood what venture capital was. “We started every meeting with a slide that asked, ‘What is Venture Capital?’” he says.

A London office followed in 2002 and, ahead of the European VC curve, Index backed companies including Skype, Just Eat, Deliveroo, Supercell, Adyen and TransferWise. US investments include companies such as Dropbox and Slack. “We have 20 years of operating history in Europe, so we have a bigger associated pool of founders and folks who have been part of the Index family,” explains Ilya Fushman, a partner at the San Francisco office. “In the US we operate with a little more hustle and sweat equity.”

Since opening its US office in San Francisco in 2011, however, the company’s approach has been more global. Today, 35,000 people work across 24 countries for Index-backed companies, generating close to \$10 billion (£7.7bn) in combined annual revenue. In February 2016, Index announced it had raised funds totalling \$1.25 billion, split \$550 million for seed and first-round funding – roughly seven in ten of the firm’s deals – and \$700 million for later-stage investments. The firm expects to spread most of the funds equally across Europe and the US, with Australia leading the other territories.

At the company’s weekly meetings to decide on investments, every partner in every office has an equal say. “We have all either lived or worked or studied on both sides of the Atlantic,” says Jan Hammer, one of the company’s London-based partners.

Having focused on tech and life sciences for its first 20 years, the company spun the latter business out into Medicxi Ventures, a standalone life-sciences-investment firm, in 2016. Today, Index partners are particularly interested in security, augmented reality and virtual reality, work and fintech. “Soon, somebody will build the Google for knowledge workers and the Amazon of consumer financial services,” Hammer says. “And we have an idea who that might be.” **Stephen Armstrong**

## INTERVIEW

# An alliance of equals

Index Ventures, which has backed Dropbox and Deliveroo, promotes equitable decision-making

### 1. Shardul Shah

Partner, San Francisco

-

“The core challenge for enterprises today is productivity. I am excited by what could be a foundational technology called extended Berkeley Packet Filter. It allows the real-time, high-fidelity collection of events and metrics from a variety of systems. It’s three to five years away and likely to be an enabling tech that not a lot of people talk about, but it’s so powerful.”

### 2. Ilya Fushman

Partner, San Francisco

-

“From Dropbox to Slack, the way people work is fundamentally changing. However, there are still too many industries and processes that are paper-based and offline. In retail, for instance, workers still communicate mainly in the written word. There are huge opportunities for startups fundamentally transforming those sectors by changing their underlying infrastructure.”

### 3. Gloria Baeuerlein

Principal, London

-

“I’m a growth-stage investor and I’m tracking Series A companies in healthcare and agricultural tech. There’s huge long-term need for the world to produce more food more efficiently, so I think we’ll see a tranche of ag-tech companies moving into the growth stage in maybe two to three years’ time. There are real and urgent problems to solve.”

### 4. Damir Becirovic

Principal, San Francisco

-

“Mobile is connecting an audience we’d traditionally classify as low- or middle-income – the average household. Historically, startups have focused on over-served major urban areas. We’ll see entrepreneurs who service the average consumer, making things cheaper through advances in logistics, automation and economies of scale.”

### 5. Martin Mignot

Partner, London

-

“People say mobile is saturated, but there are opportunities in areas such as fintech, food and healthcare. These are tricky to navigate, but the prizes are large. Sweden in particular is ahead of the curve in fintech and healthcare, with experienced founders having strong consumer mobile experience and a government that is forward-thinking.”

### 6. Jan Hammer

Partner, London

-

“Index is multicultural by design; for businesses today to succeed, they have to be born global. It is very important to have diversity of thought, as well as diversity in your team. I’m bullish on Brexit. I believe that entrepreneurs will always find ways to be creative, but what I would hate to see is a reduction in the mobility of talent on either side of the Atlantic.”



Gloria Baeuerlein, principal, London

'There's a huge long-term need to produce more food more efficiently'

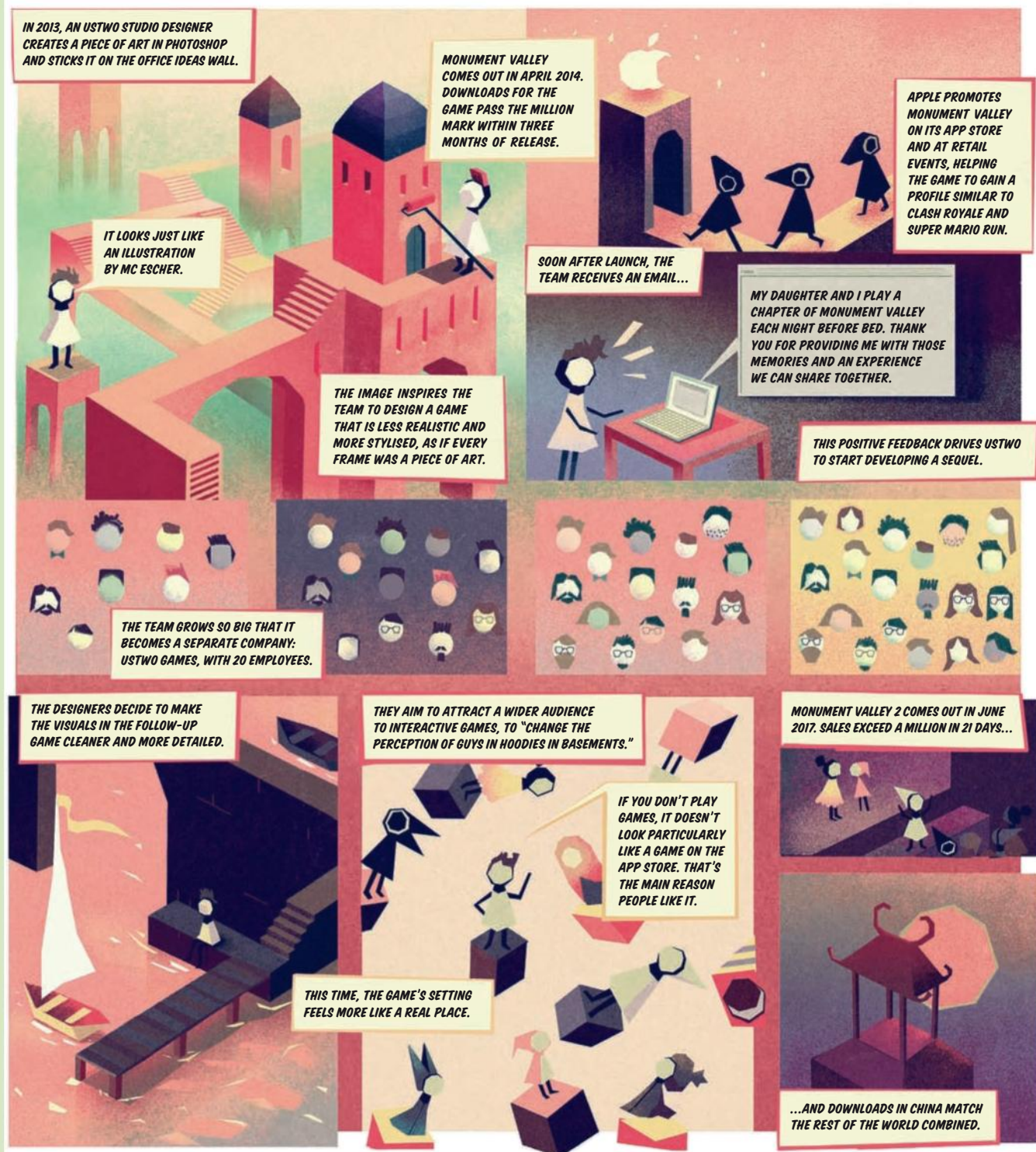


Above: Index Ventures team members photographed at its London office

## HOW WE MADE IT

# Monument Valley

The game that combines complex puzzles with high art has been downloaded more than 30 million times and spawned a sequel. Dan Gray, head of studio at ustwo Games, explains how it reached such a wide audience





## The Cambridge Executive MBA

---

“Cambridge has this critical mass of academic and business expertise, capital and connections. It’s a cluster of a sort that’s hard to find anywhere else in the world.”

Dr Eben Upton CBE FREng  
Inventor & Entrepreneur  
Co-founder, Raspberry Pi Foundation  
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How can you design an office to please everyone? Italian architect and MIT Senseable City Lab director Carlo Ratti recently took on this challenge when he was asked to renovate the headquarters of the Agnelli Foundation, a social-science think tank based in Turin. “The project’s goals were to save energy and create a unique interface between people and the building,” Ratti explains. His solution: combine internet-of-things technology and architectural innovation to allow each worker to tailor the space to their own needs, while also encouraging interaction with colleagues. Here are the key principles behind his Office 3.0 idea. **Gian Volpicelli**

## HOW TO DESIGN AN OFFICE 3.0

### ● Preference bubbles

Workers can personalise their temperature and lighting preferences via an app. Sensors around the office “create a kind of thermal bubble, which follows each individual, allowing better comfort and a reduction of energy waste”, Ratti says.

### ● Shape-shifting spaces

Open-plan offices can be distracting, so Ratti fitted the building with movable elements – glass walls, sound-absorbing curtains, foldable wooden partitions – that can be used to reshape and repurpose the space on demand by workers.

### ● Navigation

The app’s location-tracking system helps workers navigate the building. If users need a desk or meeting room, for example, the app will direct them to the closest available space. “It’s like Foursquare, but for inside buildings,” Ratti says.

### ● Room to relax

One area of the building is left unassigned: Ratti filled the space over a nine-metre-high hall with a giant tensile structure. “It is for people to jump through, walk through or rest – to nurture moments of creative relaxation,” he says.

## THERE’S A STARTUP IN EVERY BIG COMPANY

The Lean Startup author Eric Ries wants all of us to think like entrepreneurs

**Eric Ries recalls having similar conversations with several startup founders. They’d tell him they hated everything about big companies – the bureaucracy, the politics, the corporate culture. To which Ries would respond: “If you hate big companies so much, why are you trying to create a new one?”**

“People have this very fixed idea in their minds that there’s such a thing as a startup and then there’s such a thing as an established company,” he says. “But it’s clearly a false dichotomy, because no startup intentionally wants to stay small.”

Since Ries’s bestselling book *The Lean Startup* was published in 2011, his principles of iterative development and continuous innovation have largely come to define the startup approach to business. In his new book, *The Startup Way*, he takes his methodology beyond early-stage ventures to established businesses and even multinational corporations. He argues that an entrepreneurial mindset is necessary for any company working in today’s economic environment – whether its employees wear jackets and ties or hoodies and trainers.

In fact, he says, if a company wants to stay innovative, it needs to consider entrepreneurship as a function as vital to its organisation as a finance or marketing department. “Who’s in charge, in most companies, of making sure that new research breakthroughs are commercialised?” he says. “Who’s responsible for making sure the





#### JARGON BUSTER:

**MINIMUM VIABLE PRODUCT** The simplest version of a product you can make in order to test assumptions

**VALIDATED LEARNING** A way of measuring progress, backed by data, based on how much the team has learned

**BUILD-MEASURE-LEARN** Build a product, test it with customers, then decide whether to pivot or persevere

**PIVOT** The decision to make a significant change in a company's strategy or direction

**INNOVATION ACCOUNTING** A way of evaluating early indicators of progress when usual metrics are not useful

**THE SECOND FUNDING** A company's shift to a new organisational structure once it has scaled up



#### INTERVIEW

really wanted before developing it further. After working on many other pilot projects with GE (“We did a diesel platform, a deep-sea drilling thing, a refrigerator, a neonatal incubator for developing countries and an ultrasound.”), Ries helped to develop its FastWorks programme, which offers a framework for small teams within the company to act like startups on specific projects.

In *The Startup Way*, he calls this kind of internal startup the “atomic unit of work for highly uncertain terrain”. Got a project with unknown variables? Recruit a small team and let them experiment. The same tools could be used to take an existing product to a new market or even to develop an internal product such as an IT system or HR policy.

Identifying entrepreneurially minded people within a company to lead these initiatives isn’t difficult, Ries says: everyone already knows who they are. They are the ones that managers go to when the CEO asks for something disruptive. They might have a reputation as a rule-breaker, and always seem to be around when breakthroughs happen.

Ries highlights Amazon’s “two-pizza team” concept as a good example of internal startups working within a large firm. The company reportedly limits team sizes to as many people as can be fed by two pizzas, in an effort to improve productivity and encourage innovation. “I don’t think it’s a coincidence that they’ve had numerous industry-defining, unrelated products,” Ries says. Crucially, the company is also good at tolerating failure: for

company is not ultimately disrupted by some startup? Who’s in control of developing people who think of themselves as innovators first and foremost? You look at these responsibilities and it’s very clear that nobody’s in charge.”

One company Ries has tried his approach with is about as far away from a startup as you can get: multinational conglomerate General Electric (GE). Its vice chair Beth Comstock and then-CEO Jeff Immelt asked Ries to run a workshop with one of its teams. “I figured it would be a software thing,” he says. “They picked a reciprocating diesel engine.”

Initially unsure whether they were designing an engine for a car, boat or power plant, he helped the engineers figure out what a minimum viable product (MVP) – a key tenet of lean-startup strategy – would look like. The group realised it could get a much simpler engine to market in a matter of months, rather than years, which would allow them to learn what its customers

every Amazon Echo, there’s an Amazon Fire Phone.

Ries’s advice to those looking to apply a lean-startup approach to their work is to find an experiment they can afford to run and see if it produces the predicted results. He does the same thing: before writing *The Startup Way*, he created a Kickstarter campaign for a 250-page book called *The Leader’s Guide* – an MVP for the later publication. He’s also running his own startup, the Long-Term Stock Exchange, which aims to build a stock exchange that rewards long-term thinking. “Building a stock exchange would normally be a multi-decade process,” he says “We think we’ve found a way to do it faster.” **VT** *The Startup Way* (Penguin) is published on October 17

## Events, new products and promotions to live the WIRED life

Compiled by  
Amira Arasteh



### 1/ Balmain Special Edition Beats Studio Wireless

This collaboration between two of fashion and tech's heavyweights plays to the strengths of both: Balmain brings its eye for style; and Beats delivers its signature sound. Available in khaki and safari colours, they come with 12 hours of battery life for all-day listening. **£599** [balmain.com](http://balmain.com)

### 2/ C.P. Company Winter P-Lastic Coat

This military-inspired coat is weather-resistant, but at no cost to the fabric's soft feel. C.P. combines the latest ultrasonic welding and microtaping techniques to the construction to ensure a high level of performance. The puffer body lining adds comfort to this winter item. **£735** [cpcompany.co.uk](http://cpcompany.co.uk)

### 3/ Vans UltraRange

Vans' latest collection showcases the brand's most versatile trainer to date. Its UltraCush LITE foam cushioning contributes to a lightweight and extra comfortable fit, and a reverse waffle lug tread pattern offers a strong grip, making this a shoe for adventurers of all ages. **£75** [vans.co.uk](http://vans.co.uk)

### 4/ Uniqlo HEATTECH crew neck long-sleeve T-Shirt

Uniqlo's HEATTECH range of innerwear is made from a specially designed fabric that captures heat from your body and retains it to keep the wearer warm. Available for men and women, each item has argan oil added for extra moisturising effect and a supple feel. **£12.90** [uniqlo.com/uk](http://uniqlo.com/uk)



1 2  
3 4

## WIRED INSIDER'S PICK OF UPCOMING EVENTS

### WIRED RETAIL

Our annual summit to explore the future of retail brings representatives from eBay, John Lewis, Amazon, Farfetch and others together to discuss the latest innovations and trends impacting virtual – and bricks and mortar – commerce. **October 11, 2017** [wired.uk/retail17](http://wired.uk/retail17)

### WIRED ENERGY

Meet influencers and leaders, from suppliers and FTSE 500 companies to startups, at the first WIRED Energy event. Confirmed speakers include connected-home innovator Nina Bhatia, tidal-energy pioneer Inna Braverman and micro-grid entrepreneur Lawrence Orsini. **October 12, 2017** [wired.uk/energy17](http://wired.uk/energy17)

### WIRED LIVE

WIRED's flagship event reboots as WIRED Live – celebrating every aspect of our world, with ideas, technology, design and more. Already confirmed: former Formula One driver Nico Rosberg, Improbable founder Herman Narula and EU Commissioner of Competition Margrethe Vestager. **November 2-3, 2017** [wired.uk/live17](http://wired.uk/live17)

### WIRED NEXT GENERATION

Next Generation is an inspirational event dedicated to, and curated for, 12- to 18-year-olds. Expect a day of compelling talks and fun workshops – speakers include *The Sky at Night's* Maggie Aderin-Pocock and Core Research Labs' Farah Ahmed. **November 4, 2017** [wired.co.uk/event/wired-next-generation](http://wired.co.uk/event/wired-next-generation)

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# WHY IS ANTI-SCIENCE SENTIMENT SO POPULAR?

WIRED ASKS THE WORLD'S  
GREATEST SCIENTISTS

## WILL AI REPLACE SCIENTISTS?

WIRED

## DO FACEBOOK AND GOOGLE HAVE TOO MUCH CONTROL?

## WHAT WOULD YOU SAY TO TRUMP IF YOU MET HIM?

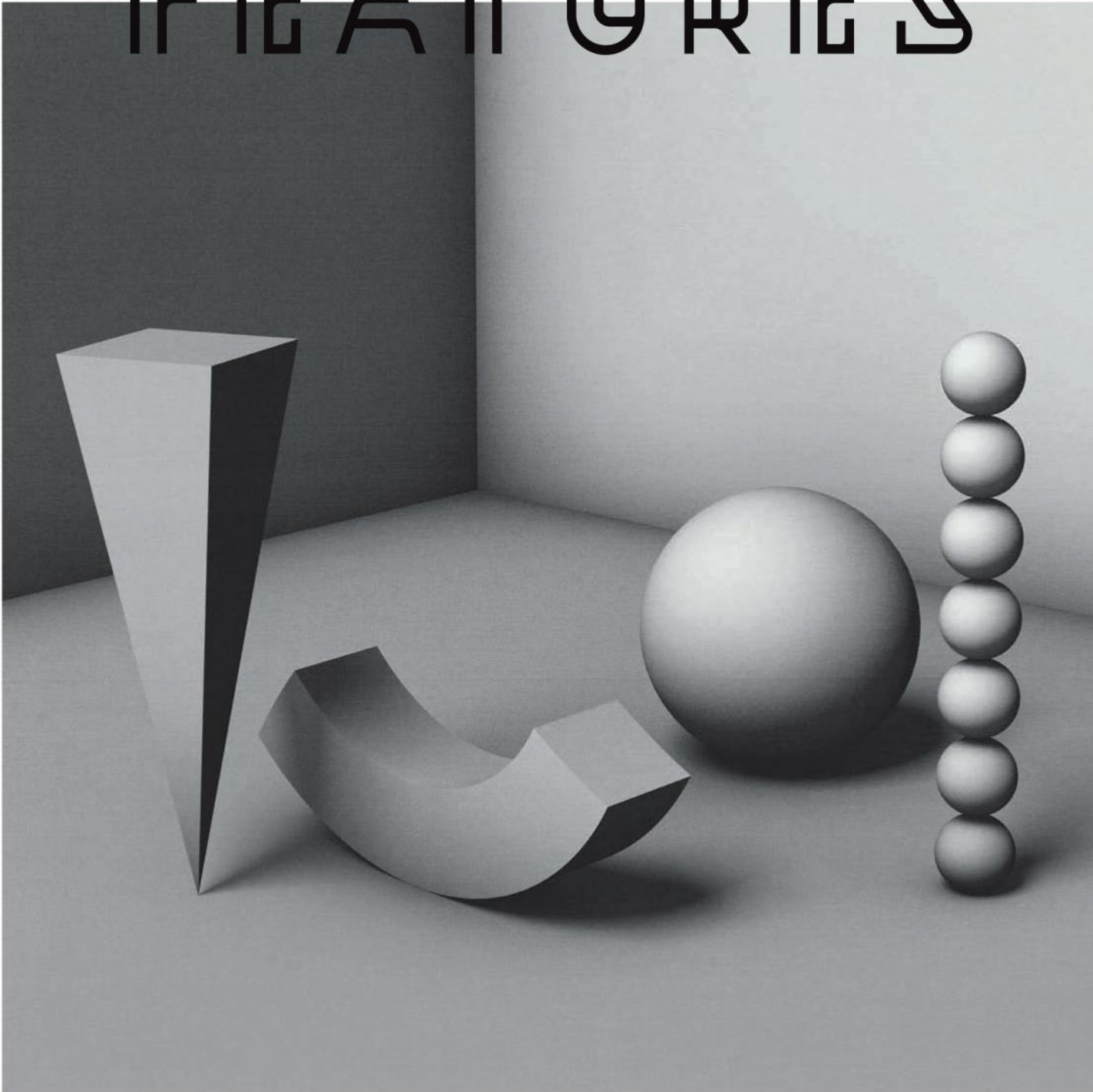
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## HOW CAN WE SAVE SOCIETY?



# REARVIEW

ILLUSTRATION: TIMO LENZEN, USING 3D AND CLASSIC PROGRAMS AND SCANNED TEXTURES TO CREATE RENDERED OBJECTS ARRANGED LIKE A STILL LIFE



**"Our industry doesn't care about past successes. It's all about the future."** Satya Nadella, p90

# MICROSOFT'S HERESY

By  
**GREG WILLIAMS**

Photography:  
**ERIK MADIGAN HECK**

When Satya Nadella became the Seattle company's CEO, he transformed its entire culture. But can he keep it ahead of the curve in the AI era?





"MIXER IS JUST THE MOST FASCINATING THING," SATYA NADELLA SAYS. He's examining a large terminal situated in a corner of his office, where he stands before a real-time data visualisation hosted on Microsoft's streaming platform. "Somebody is broadcasting Japanese seismic activity and there are 25 people watching it," he laughs.

On entering the room, visitors must pass a bookcase that's well stocked with framed family photos. More books are neatly piled on a shelf on the other side of the room – Yuval Harari, Tracy Kidder, Michael Lewis and scholarly thinkers on business and leadership, as well as technology. Beneath is a signed, framed photo of Australian cricketer David Warner (the captain of Nadella's team, the Sunrisers Hyderabad) and, in pride of place, his most-prized possession – a bat signed by Sachin Tendulkar, the former Indian cricket titan and national obsession.

It's comfortable and convivial, a college professor's study. By CEO standards, it's modest. The contents reflect a couple of themes that emerge in *Hit Refresh*, Nadella's book, published in September, that's part leadership playbook, part management philosophy and part personal history. Firstly, he didn't grow up wanting to be an executive, but a cricketer, recalling in the book the trauma of attending his first test match in the 70s, which India lost to England by one innings. The aspiring off-spin bowler played until college, when cricket was displaced as his passion by computing. The seed of this conversion had been sown in the 80s, when Nadella's father returned from a trip to Bangkok with a Zilog Z80 computer kit for his then 15-year-old son.

Secondly, Nadella comes across as a thinker as much as a doer. He references poets and philosophers. "Most of my reading is economics and society. Then there's AI and general business." Fittingly for the son of a Marxist economist, he recently read Wolfgang Streeck's *How Will Capitalism End?*, a series of essays on the collapse of the neoliberal order. "He says that capitalism is a strange system in that it expects two things: employees to be insecure, but [also] confident consumers," he chuckles. "That's what we're dependent on – it's not a stable system! 'Oh my God. I might not have a job tomorrow, but I've got to spend like a confident consumer.' [Streeck] is saying *that's* our problem, so you've got to create a solution."

A crow hops along the windowsill, and talk switches to Pakistan's thrashing of India in the ICC Champions Trophy in London in June. "I cannot believe it..." Nadella says of the Indian batting collapse, with a shake of his head and a rueful smile.

These are not conversation topics usually associated with Microsoft's senior-leadership team. Nor is the language Nadella uses to describe how he has transformed the company's economics, perception and culture. In doing so, he wants Microsoft to change from producing products that people *need*, to producing products that consumers *want*.

If he can take the next step – convince consumers to love the company – it will be an accomplishment that ranks alongside the highest achievements of his predecessors. The process began with a question that he addressed to the corporation's 120,000 employees when he assumed the role in 2014: what would happen if Microsoft disappeared?



Above: Satya Nadella playing cricket in Hyderabad. He once dreamed of playing the sport professionally

IT'S A BALMY JULY DAY IN THE AFFLUENT SUBURB of Bellevue, which lies 15 kilometres east of Seattle, across Lake Washington. Mount Rainier pokes its head above the swaying conifers that adorn this part of the Pacific Northwest, the mountain a spectral, lunar presence to the south-east of the city.

The conversations with cabbies, bar staff and professional classes in this affluent, liveable city pivot around the inexorable, dramatic rise in house prices. The city's real-estate boom is being driven by the seemingly unstoppable rise of the Puget Sound area's tech companies. We have been here before, of course. In the mid-to-late 90s, the value of homes in the city increased dramatically. One constant in both these booms is the city's third-largest employer (and largest in the technology sector), Microsoft.

To some degree, the 42-year-old company may be responsible for creating what we think of today as a large technology player – one that produces innovative, world-changing products which become integrated into our everyday lives in a way that we barely notice them, before assuming a dominant market position that eventually attracts the attention of regulators. It was the first to have its CEO on the nightly news, as Microsoft battled in US courts to maintain its supremacy in the PC market.

Microsoft may not have been the world's first household-name technology company – IBM takes that accolade – but it was the first to have a CEO whose name was synonymous with the company: Bill Gates. As co-founder of the company with Paul Allen, Gates personified Microsoft in all its wonky, groundbreaking, sharp-elbowed, market-pleasing dominance of the software industry throughout the 90s and early part of the 21st century. He was the software CEO who could develop and market products, as well as peering peevishly through

## MICROSOFT THROUGH THE DECADES



NADELLA ON:

## Tech companies and regulation

**Sometimes people bracket us all as American tech companies. In reality, each one of us is different.** It goes back to that sense of identity. The only tenable, long-term, stable strategy for a multinational company is going to be about the local opportunity that you create in every country you operate in. I don't believe there's a long-term strategy that says, 'I'm just going to be a rent collector in different places.' Because that doesn't work. Inside Microsoft, we have a business model wherein our technology is about empowering people so they can use that technology to create their own success. There lies the local opportunity. If you're operating in the UK, you've got to be UK first; in the United States, you've got to be United States first. The only way that will happen is by asking, 'Is there local employment being created in your channel? Are there local startups that are relying on your technology to create their own? Are small businesses becoming more productive? Is the public sector more efficient?' That's how I think of Microsoft's role."

his spectacles at Senate committees or testifying in court cases brought by the Department of Justice. He was the CEO who embodied the actuality that software had become the most valuable commodity in the world.

There have only ever been three Microsoft CEOs. Gates was succeeded by Steve Ballmer, a robust, high-energy marketer hired by Gates and Allen after he'd dropped out of Stanford Business School to be the company's first business manager. Ballmer took the reins in 2000 and oversaw a decline in the company's prestige and value as it came under pressure from new challengers, which were building technology businesses in areas where Microsoft was slow to adapt. When Ballmer was appointed, the company derived most of its revenue from its Office and Windows software. When he departed 13 years later, this was still the case, but the world had moved on: consumers had gone mobile and business wasn't server-driven in the way that it had been just a few years before.

On January 24, 2014, Nadella, who was at the time running Microsoft's cloud-computing division, received an email from John Thompson, then the lead independent director at Microsoft, asking to talk. Nadella took the subsequent call on speakerphone late in the day, standing in his office holding a Kookaburra cricket ball. Nadella, then 46, was informed of his appointment to the top job.

Nadella is lean and talks rhythmically with clear points of emphasis, his sentences tilting upwards towards a crescendo. He often smiles when he talks, as if to reassure the listener of the veracity of his words. In conversation, he might quote Friedrich Nietzsche or Gautama Buddha, but he gets away with it because he presents himself as unpretentious, an enthusiast who can make small talk, as well as think big thoughts.

He had a peripatetic upbringing. His father worked for the Indian government and was transferred regularly. Nadella recalls being raised in "old colonial buildings in the middle of nowhere... in a country being transformed in the 60s and early 70s". When he was six, his younger sister died aged five months. His mother, a Sanskrit teacher, hung a poster of Lakshmi, the Indian goddess of contentment, in her son's room.

Nadella wasn't awarded a place at Indian Institutes of Technology, the subcontinent's powerhouse science and technology colleges, so he studied engineering at Manipal Institute of Technology in south-west India. After graduating, he applied to US colleges, assuming that a visa would elude him. To his surprise, he qualified and was accepted to study for a master's in computer science at the University of Wisconsin-Milwaukee. In August 1988, on his 21st birthday, he flew from New Delhi to Chicago. Midwestern winters were an unforgiving experience for a young man from southern India. After graduating in 1990, Nadella went to work for Sun Microsystems, then a giant computing system and hardware organisation that employed Eric Schmidt and Reed Hastings.

One rainy day in November 1992, Nadella arrived at Building 22 in Redmond. Over the coming years, Microsoft would enter its pomp. He recalls being able to hear Ballmer down the hall in someone's office. "They were having this animated discussion - 'God, who is this guy?!'"

Nadella has been at Microsoft ever since and, despite being a long-time executive, has sought to bring essential change to a company that, under the trend-shy Ballmer, appeared to be in the early stages of a precipitous demise. What Nadella has done is not only bring Microsoft out of decline (at the time of writing its stock is at its highest-ever level - up 19 per cent in 2017 thus far), but to change the nature of the company internally and - miraculously - its image externally, to make it the kind of place that ambitious engineers and researchers might choose over its rivals. There is much to do: PC products still account for the majority of profits, and margins for cloud-based services are much thinner than those for software, but - whisper it - is Nadella building a company that finally has its swagger back?

"The greatest challenge is in managing the transition, from a world where Windows was at the centre and the business was built on software licensing, to a world of cloud, mobile and AI, where the model is moving away from licence towards subscription," says Brad Silverberg, a founding partner at VC firm Ignition Partners, who ran the Windows business and was part of Microsoft's executive committee. "It's incredibly disruptive and needs to be handled with skill. Go too fast and you destroy your business; go too slow and you become a dinosaur. Satya has done a fantastic job with this transition."

MICROSOFT FOUNDED BY  
BILL GATES AND PAUL ALLEN

# 1975

THE COMPANY GOES PUBLIC - AND ITS  
SHARE PRICE RISES FROM \$21 TO \$28

# 1986

NADELLA ON:

## Universal basic income

**It's clearly a good idea. But just having it doesn't solve the sense of purpose. In my case, for example, I have a couple of special-needs kids, so I see the amount that one can do in terms of people-on-people jobs, right?** If you think about physical therapy or occupational therapy and so many things where empathy is key, in a world where there's AI in abundance, what's going to be scarce is real intelligence and empathy. Then maybe we as humans will have to become experts on that. Maybe it's not really about computer-science PhDs, but developing more human EQ [emotional intelligence] is probably going to be the most important thing we can have."

**OUTSIDE BUILDING 34, WHERE THE** Microsoft executive offices are located, a fresh breeze blows across the manicured Microsoft campus with its 84 structures, football pitches and communal cafeterias. Young people, mostly male, with lanyards around their necks, walk between buildings staring at devices. If there is ever a global shortage of cargo shorts, the Microsoft campus should be the first port of call for investigators looking for surplus.

When he assumed the role of CEO, Nadella knew what he had to do was potentially incendiary: the job would involve shifting not just company strategy and business practices, it required a root-and-branch overhaul of culture. "We used to hang on to our past success too much and our industry doesn't care about past success," he says. "It's all about the future and pretty much every industry is like that nowadays. Being successful in the past means nothing."

He describes a time when the organisation would make decisions about products based solely on what its rivals were doing. Today's vision, he says, is to focus on developing products and services only if Microsoft has something unique to offer: "That sense of *purpose* has to inform the decisions on what we do."

"We pride ourselves on being an engineering-focused company," says Scott Guthrie, who runs the Cloud and Enterprise Group at Microsoft. "As we got more successful, you can get into the 'If

we build it, they will come,' kind of mode and you can get a little bit more separated from customers as you get bigger." As part of the cultural shift within the division, Guthrie doesn't use revenue as a benchmark any longer, focusing instead on users – meaning growth – rather than takings.

According to a senior member of Microsoft management, at Nadella's first meeting with executive staff in early 2014, he focused on a discussion of company culture, rather than the organisation's ailing business. "It's not like I started with a blank sheet of paper," he says. "I actually had a well-formed view on that entire framework before I became CEO. It's not like that sense of purpose was not something I started thinking about the day I became CEO, but it was there subliminally in what I was thinking about it... One of the things that even Steve [Ballmer] told me is, 'Just be your own man.'"

Nadella demonstrated this in July 2015, when, as CEO, he announced that Ballmer's \$7.2 billion (£5.5bn) purchase of Nokia in September 2013 would be written off. The phrase Nadella used to redefine the new Microsoft mission was that the organisation needs to have a "challenger mindset". If the company defined itself as being an incumbent, it faced an existence where "everything is defence".

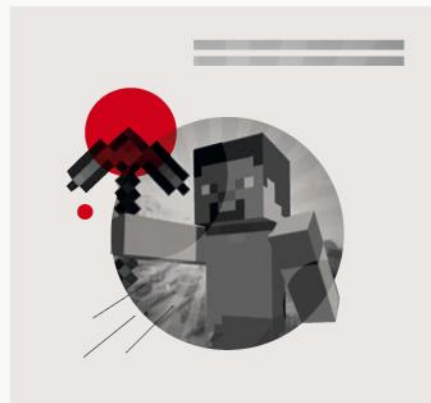
Changes occurred during the annual gathering of the company's top executives: traditionally a retreat involving only the most senior leaders,

it was upended by invitations being extended to the founders of startups Microsoft had acquired over the previous year. Worse, invitations were extended to *customers*. There was pushback, but Nadella continued to advocate change.

"He's good at energy and enthusiasm," Guthrie says of Nadella. "He makes you feel like this is the most important thing happening in the entire world."

Silverberg shares similar views: "His style is mature, collaborative and supportive. Very partner-oriented. He leads by example, and companies are often defined by the character of the leader. Teams inside Microsoft today are more likely to have a shared vision and work collaboratively towards achieving the company's goals. He is sincere, caring and trustworthy, and that spreads throughout the organisation."

Another of Nadella's initiatives was to start meeting people that enterprise companies would usually disregard: customers who had gone with rivals. This sense of looking outside the organisation was also applied to the way Microsoft operated: today its products are available on other platforms and the company partners with competitors. *Minecraft* is available on the Xbox and PlayStation, despite Sony being Microsoft's main competition in the console market, and also on Nintendo, iOS and Android. Office runs on mobile devices that use its competitors' operating systems. Linux, for so long considered the enemy, is now supported on Microsoft's cloud platform Azure. The



Above: Nadella green-lit the purchase of *Minecraft*, the second-biggest-selling game of all time

WINDOWS 95 RELEASED; ANNUAL REVENUE RISES 29 PER CENT TO \$6.08 BILLION

# 1995

LAUNCHES INDIAN HEADQUARTERS, ITS SECOND LARGEST AFTER THE US

# 1998

STEVE BALLMER TAKES OVER FROM BILL GATES AS CEO

# 2000



company is now end-to-end, or “full stack”, from software through data centres to hardware. Office works on Android. Windows works on Facebook apps and *Minecraft* on Oculus. Nadella talks of partnering Microsoft’s digital assistant Cortana with Amazon Echo. For years, Microsoft fought Google in courtrooms, but Nadella has sought to end the enmity.

“Whether it’s with Sundar [Pinchai, Google’s CEO], or whether it is with Bezos, Tim or anyone, this is a fundamental construct,” he says. “We compete hard in many areas. But instead of viewing things as zero sum, let’s view things as, ‘Hey, what is it that we’re trying to get done? What is it that *they’re* trying to get done? Places where we can co-operate, let’s co-operate.’ And where we’re competing, we compete.”

Ed Anderson, an analyst at Gartner, worked for both Ballmer and Nadella during his six years at Microsoft’s data centre and cloud business. “With Steve Ballmer, it was much more of a ‘Show up with the facts, we’ll review them, challenge you on them and see how much work you’ve done to make sure they’re right,’” he says. “With Satya, it was very different. Regardless of who was in the room, whether it was a senior VP or product manager, he would listen intently to what people had to say. I was struck that every opinion is important to him, every perspective is important. I get the sense that he feels that everyone at Microsoft has a contribution to make. And that was a stark difference for me. I think he really values multiple perspectives. You’ll see this in the way that he interacts with partners or customers. He’s genuinely interested in what they have to say.”

In discussion, Nadella’s sense of the cultural shift to openness and partnerships can sometimes hit an existential note. His approach isn’t “as much about any particular strategy or anything, it’s a meta framework for how one pursues this constant process of renewal”. He stresses the continual nature of this progress. “Our consumer business was conceived in the 80s and 90s,” he says. “When I look at, say, [today’s] channels of reaching customers... you don’t go through the traditional channels. A company can only stay relevant if it’s able to confront those realities and continuously change. Technologies will come and go, but the sense of purpose will give us at least the direction, and how we express our identity.”

He’s aware of the challenges of change within a large organisation and admits to being unsure how the 120,000 Microsoft employees across the world would respond. “In the past, whenever we’ve tried to have these cultural values, put up posters and what have you, I wasn’t able to recall what the heck they meant or what they were, they were all corporate speak,” he explains. “I think a lot of us love to talk about



Above: Scott Guthrie joined Microsoft in 1997. He runs the company’s Cloud and Enterprise group and has changed the team’s focus from revenue to user growth

culture, but it has got to take organic root. It’s the hardest process – and there is no formula.”

When Nadella took the role, Microsoft’s circumstances were a classic example of the innovator’s dilemma: he needed to persuade senior executives within Microsoft and on the board that the organisation must stop focusing on the products that were delivering the majority of revenue and profits in favour of new endeavours with little tangible benefit.

Nadella had an advantage, in that he’d been through a similar process internally. Under Ballmer, he’d been in charge of the Server and Tools Group. In the client-server era, it had been

a huge contributor to the bottom line as the third-largest in group revenue, after Office and Windows. Nadella realised that the architecture Microsoft was using to build products such as Xbox Live, Bing or MSN were no longer reliant on what it was selling to enterprise customers. They were essentially building cloud infrastructure for their online properties.

Nadella had to convince the team to shift focus from the server business, which he describes as “the biggest transformation of Microsoft in a generation”. He did so without bringing anyone from his team at Bing. “It was important that the transformation comes from within,” he writes.

THE XBOX IS  
UNVEILED AT CES

2001

NADELLA ON:

## Leadership

“

**The larger the organisation, the more disciplined the leader needs to be in staying constant.** One of the things that I get tempted to do from time to time is say, 'I have talked about this an infinite number of times. Let me make it more novel and sort-of just do something different.' And that is the worst mistake one could make.”





**There have been massive amounts of displacement with each technology revolution. The way we were able to overcome that, even if it was generational, was through new employment created in new sectors. So that's what I'm hopeful about.** That said, it's fair to say if there's going to be true technological displacement and there are no jobs in any sector, whether it's blue collar or white collar, then what exactly are we going to do to ensure there are? Because then it's all about return on capital and there's no return on labour. I go back to the early Industrial Revolution in England, and the solution to it. There was a redistribution, which is a scary word, but at the same time, what somebody will have to entertain and say is, 'If there's return on capital and no return on labour, what will be the moral equivalent that creates it?' What is labour for? What are the jobs of the future? Jobs are not just economic – they also ground us in that sense of purpose. I believe that's another societal social challenge that can be solved."

**EARLY IN *HIT REFRESH*, NADELLA WRITES ABOUT** the birth of his son, Zain. One night in August 1996, Nadella's wife Anu, then a nascent architect, noticed that the baby she was carrying wasn't moving in the way that she had become used to. The couple waited for a while at A&E in Bellevue before she was examined by doctors, who ordered an emergency caesarian. At 11.29pm the child was delivered. He weighed three pounds and made no noise. The following morning, Nadella went to visit his son at the Seattle Children's Hospital, where Zain had been transferred to a specialist unit. "Little did I know then how profoundly our lives would change," he writes.

Eventually, the couple learned that Zain had undergone perinatal asphyxiation and was suffering from severe cerebral palsy, meaning that he would have to use a wheelchair and require life-long care. The way Nadella tells it, his initial reaction was to think subjectively about what had happened.

"I was born a single child of middle-class parents from India; so was my wife. Both of us were here," he says. "Then our first son was born when we were 29, and I would say it took us multiple years to accept what had happened.

"That process, and seeing all the people around Zain, completely changed a lot of how we have viewed the world and recognising, even within our relationship to our own son,

that the first few years was more about, 'Oh, what happened to me?' And then I woke up finally to the fact that nothing happened to me, it happened to my son. And that ability to *get* that, itself, was probably one of the bigger mental breakthroughs.

"There's this lady who goes to Buddha and says, 'Hey, my son died, can you bring him back to life?' And he says, 'Go find one family where there has been no death and come back with a grain of rice from that family and your son will be reborn.' The reality is that all of us have something or other where there is a way for us to develop empathy. It is just that we have got to tap into it."



Above: Nadella with Microsoft co-founder Bill Gates (centre) and former CEO Steve Ballmer in 2015

Nadella, who also has two daughters, argues that this experience is at the core of his vision for Microsoft. "My passion is to put empathy at the centre of everything I pursue – from the products we launch, to the new markets we enter, to the employees, customers and partners." Within the first 11 pages of the book, Nadella has set out his stall: Microsoft – and its employees – must have a higher calling. Each individual must pursue personal passions to empower others.

But there are harder-edged realities to running the company with the third-largest market capitalisation in the US. The day before we meet, Microsoft announced that there

LAUNCHES MICROSOFT SURFACE  
SERIES OF TOUCH-SCREEN PCS

SATYA NADELLA  
APPOINTED AS CEO

2012

2014

NADELLA ON:

## Artificial Intelligence

**The first Microsoft product was the BASIC interpreter that Bill Gates and Paul Allen wrote for the Altair. It was all about building tools that allowed hobbyists to write computer programs for new computers. And that's at the core of who we are. We're tools makers.** We know how to make it possible for people to write apps for emerging platforms. So how do I bring that mindset to machine learning and AI? Our job is to democratise it so every company can be an AI company. AI is all part of the stack. It is infrastructure – you should have whatever GPU compute you want, so you can build your own intelligence. It's a set of APIs. If you want speech recognition, you want image recognition and text understanding. It's about applications with built-in AI. Every part of what we do will be AI. But, more importantly, every company that works to build something of their own will incorporate AI. That's what I mean by democratising AI. AI is perhaps the most transformative thing that's ever happened."

would be thousands of job losses – some reports suggested 3,000 – mainly for salespeople. Nadella talks of the importance of being able "to do the right thing by them, and do the right thing for the company to change". Then there is the balancing act of ensuring that short-term quarterly earnings reports are balanced with long-term planning in a highly competitive sector, which is moving at breakneck speed to build tools that the rest of the world relies on to develop its own businesses.

Nadella has written about betting the company on AI. Two recent initiatives suggest that Microsoft is competing aggressively with Google's DeepMind and others in the space, such as the nonprofit OpenAI. In July, the company announced that it was opening Microsoft Research AI in Redmond, to work on areas such as natural-language processing, reasoning and perception – a clear move towards the development of a general-purpose AI rather than a narrow version that can perform a single task.

The same month, Harry Shum, who heads up Microsoft's Artificial Intelligence and Research Group, announced a deep-learning processor for HoloLens, which will run the software behind speech and image recognition for the mixed-reality platform. The announcement came just a couple of months after Google announced a cloud service that will provide access to a proprietary AI chip that is designed to train and execute deep neural networks.

Nadella's belief is that, for Microsoft to become an enduring company, it will need to find success in cloud, quantum, sensors, mixed reality and AI. He is making big bets on this. The company is investing heavily in being the first to bring quantum technology to market, with a timeline of three to five years. There is talk of possible initial use-cases

in applications for chemistry and biology, although there is still some debate as to what the business model will be.

"You need to have high ambition and a long-term approach to R&D, right?" Nadella explains. "As I said, we got started on what is mixed reality with Kinect, and it's taken us decades. It's a similar approach that we are going to take with quantum. There are break-

throughs in maths to physics to computing that all have to come together to make a quantum computer really real."

Microsoft is distinguishing HoloLens by the fact that it is mixed reality. It can be virtual (fully immersive) or augmented (with digital images layered on top). "We've got started on this journey of essentially thinking of the field of view as a new natural interface," Nadella says, citing use-cases in medicine, logistics, retail and gaming. (*Minecraft*, which was purchased by Microsoft in 2014, is the second biggest-selling game of all time.)

The products that technology companies generate are having a profound effect on individuals, civil society, governments, institutions and the law. Between them, the world's most powerful technology companies are compiling vast amounts of data about individuals at a dizzying speed. Nadella acknowledges that consumers should have rights over their own data and that there should be a value exchange when tech companies use private information. "There should be transparency around why we're collecting that data. There should be control with the user in terms of what data is being collected and not collected."

Privacy also came to the fore in February 2016, when a federal judge asked Apple to unlock an iPhone belonging to Syed Rizwan Farook,



Above: Nadella believes that Microsoft HoloLens will usher in an era of "mixed reality"

MICROSOFT WRITES OFF \$7.6 BILLION FROM ACQUISITION OF NOKIA IN 2014

# 2015

MARKET SHARE FOR GOOGLE CHROME OVERTAKES INTERNET EXPLORER

# 2016



NADELLA ON:

## AI and ethics

**We are in some sense quite a way from artificial general intelligence. But we are on the ladder towards it. So what should be the ethics of AI? Let's leave it to the moral philosophers to write about that. But we should take more ownership.** What are the guidelines and the responsibility we should have? Just like we have, for example, guidelines for good user experience. How accessibility, for example, has to be built in, and universal design should be something that we build in. What's the moral equivalent? It's a design choice, which is that we can either choose to build AI that augments human capability versus going first and foremost to saying, 'Well, let's replace it.'

"Also, who takes accountability? Even if it's a black box, the reality is that black box has a lot of metadata around it and choices that inform it. We have an ethics committee led by Eric Horvitz. More importantly, I think that regulation will catch up with this technology, and I think there will be a broader dialogue about AI and the displacement it causes."

the shooter responsible for 14 deaths during the San Bernardino shootings in December 2015. Tim Cook described the court order as "chilling" and the company refused to comply.

"We were very clear that any notions of back doors and so on are bad ideas," says Nadella, who supported Cook's decision. "But, at the same time, we have always said that there is a responsibility for the state to protect its citizens. And, therefore, there should be a mechanism that is legislated and a law of how the government goes about that process. It cannot be left to the CEOs of tech companies arbitrating the policies for the world. It's a strange position to put four or five of us in, to decide for the world what should be the equilibrium. Nobody elected us. If we believe in democracy, the legislatures should take back control of what is the rules of the land."

Recent attempts by President Trump to harden the US border to immigrants have not been received well by startups or large technology companies alike. Nadella tactfully positions the issue as one associated with economic growth: talent, ideas and new technologies are key for innovation and advancement. As an immigrant (and one who had to give up his green card to ease his wife's passage into the US), he has an uncommon perspective for a CEO.

"I'm a product of two uniquely American things," he says, "which is American technology



Above: Nadella at an American Technology Council meeting in June 2017 with (l-r) Tim Cook, Donald Trump and Jeff Bezos

reaching me where I was growing up and giving me the opportunity to dream the dream of coming here. And then the immigration policy allowing me to stay and live that dream. I think of those two opportunities I was given as something America should always stand for."

Soon after he took over as Microsoft's CEO, Nadella had a meeting with Ballmer.

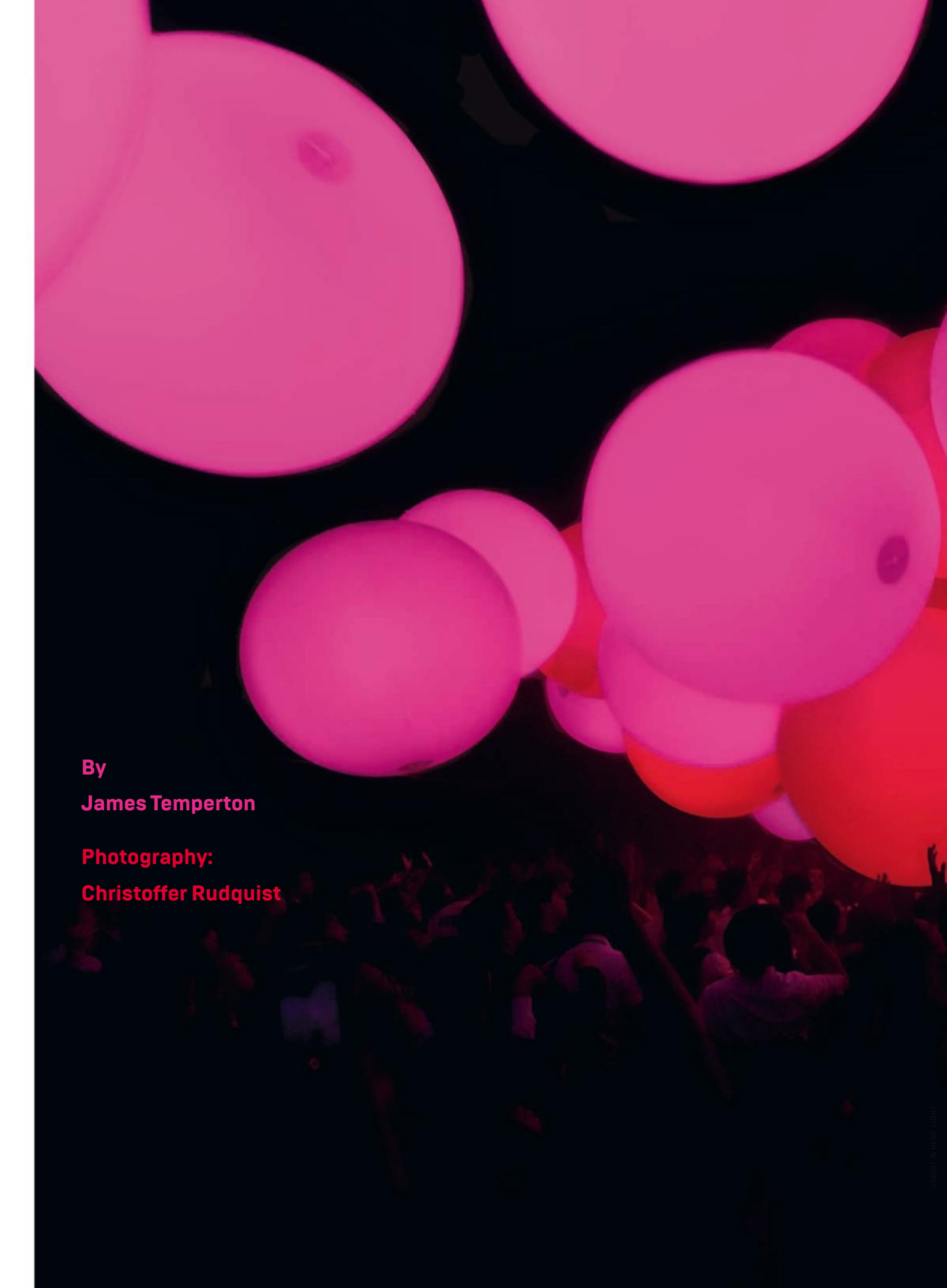
He asked his predecessor if he had any plans to write a book about his time in charge of the company. Ballmer admitted that he had thought about it, but writing about the past didn't seem too appealing a prospect. He was more excited about his May 2014 purchase of the LA Clippers basketball team and other fresh projects he had in the pipeline.

Ballmer's words stayed with Nadella and, when he was writing his own book, he realised that the end product would be the "meditations of somebody who was sitting in the seat and going through the process". He pauses for a brief moment... "And knowing that you are not done, by any means." ■

*Greg Williams is the editor of WIRED. He wrote about the rise of algorithmic trading in 04.17*

ON JULY 21, MICROSOFT'S SHARE PRICE  
HITS AN ALL-TIME HIGH OF \$74.30

# 2017



**By**  
**James Temperton**

**Photography:**  
**Christoffer Rudquist**



A large crowd of people is gathered at night, looking up at several massive, glowing spheres. The spheres are primarily a vibrant pink color, with some showing a gradient to orange or yellow. They appear to be floating or suspended in the dark sky. The people in the foreground are silhouetted against the bright light of the spheres, with some raising their hands in awe.

**Floating Spheres  
of Omura Shrine**

Participants at  
Kushima Castle,  
Japan, interact  
with teamLab's  
tactile, colour-  
changing globes

芸術を通じてユートピアを創造する  
**Design collective teamLab wants to  
turn the world into a work of art**

**On the 24th floor of a skyscraper in Tokyo's high-rise Roppongi district, an** entire office has been transformed into a jungle. Walk out of the lifts and you're greeted by a waterfall of lights connected to motion sensors that create a dancing, rippling effect as people pass through. In a dimly lit corridor, a menagerie of 26 animals – from anteaters to zebras – slink along the walls, guiding visitors to meeting rooms. More than 250 types of plants spring up from every spare patch of floor space, kept healthy by a network of irrigation pipes and artificial daylight. "Working here, you feel like you're part of a beautiful environment," says Takumi Nomoto, chief creative officer at DMM.com, the Japanese e-commerce company that calls this jungle home. We're sat in a brightly lit meeting room behind a door guarded by a virtual *nihon kamoshika*, a Japanese goat-antelope. All the animals are made up of flowers and butterflies. When a visitor arrives, they are assigned an animal guide, who they then have to follow along the corridor to the correct meeting room. When they reach their destination, the animal bursts into a dazzling display of light and colour to announce their arrival. "I didn't want to just take art and hang it on the wall," says the softly spoken Nomoto, dressed in a striped blue shirt and matching distressed denim jacket and trousers. "I wanted to integrate it into the organisation, into the daily tasks." Outside, the glass-and-steel towers of Tokyo's business district gleam in the mid-afternoon sunshine. Inside, there's the distinct musk of damp soil and vegetation. "It's about creating something that's against what people see as the norm," Nomoto says, smiling. "If I go to a museum and I see art hanging on the wall I don't feel any connection to it, it's just a painting on the wall. However, if you're part of the art, if you play an integral part, then you can connect with it."

**T**

**he installation is the work of teamLab, a little-known Japanese** software and design collective. Founded in 2001, for ten years the company was shunned by Tokyo's art scene. "We showed in spaces, not galleries. People didn't treat us as artists," says Takashi Kudo, 40, the company's communications director and one of its designers. Then, in 2011, renowned Japanese artist Takashi Murakami invited teamLab to display a piece at his Kaikai Kiki Gallery in Taipei. Titled *Life Survives by the Power of Life*, it was a mesmeric 3D animation of blossoms and butterflies winding around a calligraphic, tree-like structure. It was a runaway success. Since then, teamLab has been embraced by the art community not only in Japan, but around the world. As its reputation grew, so did the ambition of its work. One of the company's largest projects to date, spread across a 500,000 square-metre park on the north-west of Kyushu island, turns the natural world into a canvas, using the cover of night to coat trees, rocks and waterfalls with projections and light on a vast scale.



Below: TeamLab  
designer and  
spokesperson  
Takashi Kudo





**TeamLab's  
creations:**

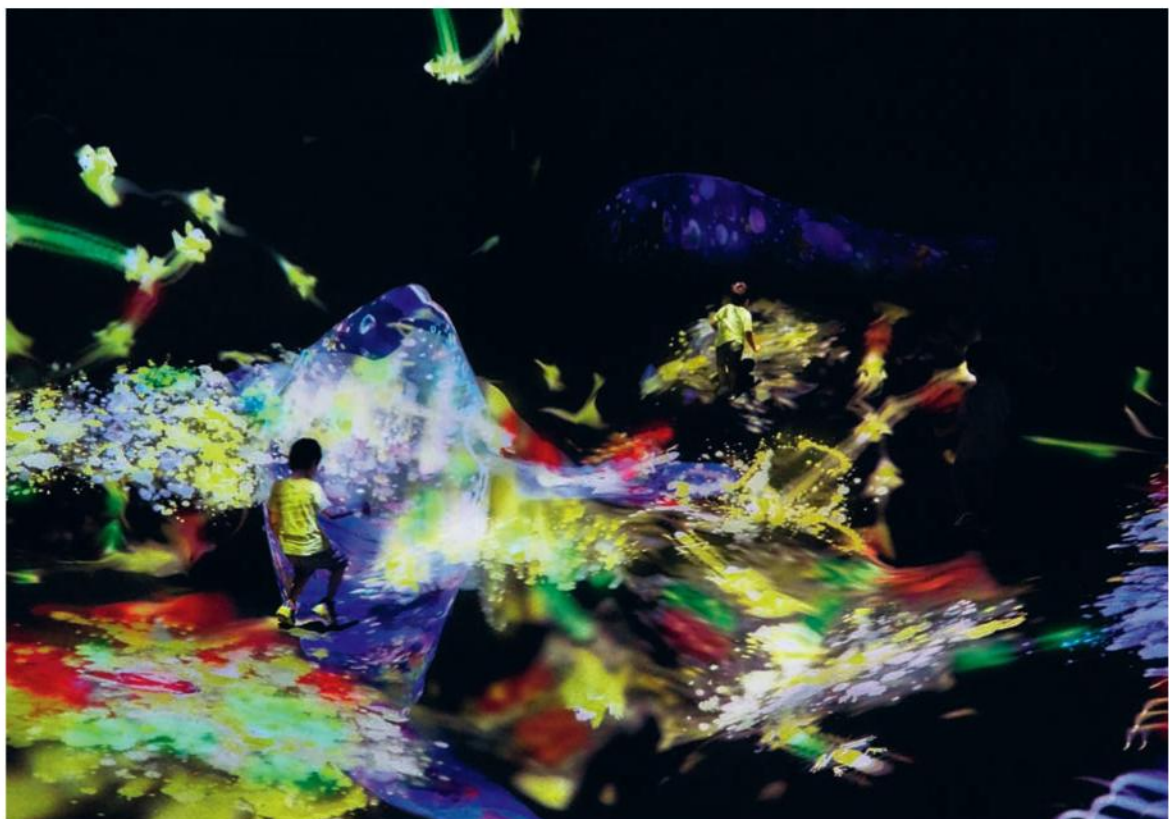
**Crystal Universe**

-  
On display throughout July and August 2016, this light sculpture was inspired by pointillist painting. Each light is hooked up to a sensor system, letting the sculpture change as people pass through it. Visitors could use an app to control some of the sculpture's elements.



**Kids Noon**

-  
Running alongside the Art Night event for adults (*far right*), teamLab's daytime festival for children used sensors and light to create a vast interactive space where youngsters could work and play together. The Art Night festival also included teamLab's Learn & Play! Future Park.





#### **DMM.com**

-  
Opened in May 2017, the corporate offices of Japanese e-commerce firm DDM.com feature a greenery-filled walkway, packed with hundreds of plants hooked up to an elaborate irrigation system. Immersive and interactive projections of 26 breeds of animal guide visitors to their designated meeting rooms.



#### **Art Night festival**

-  
From July to September 2017, the Art Night festival was held at Hikarie Hall in Shibuya, Tokyo, to commemorate its fifth anniversary. The event was a large-scale, adults-only interactive expo that combined music with art – it featured more than 20 teamLab works.





**TeamLab's  
creations:**

**Fight with a Carp**

-  
Developed in partnership with Japanese movie studio Shochiku, teamLab projected giant multi-coloured koi carp on to the walls and artificial lake of the Bellagio Hotel in Las Vegas. It was part of an epic-scale *kabuki* theatre show about a man who falls in love with a woman who turns out to be a fish.



**A Forest Where  
Gods Live**

-  
Set in the 500,000-square-metre Mifuneyama Rakuen park on the island of Kyushu, this vast installation brings together a number of creations, from boulders covered in dancing flowers to trees that light up as people move past them.





### **Universe of Water Particles**

- TeamLab turned a building into a virtual waterfall using 3D projection mapping. The image reacts to people passing through it in real time, which in turn changes how the whole sculpture moves. It was made to simulate how water flows according to the laws of physics.



### **Forest of Resonating Lamps**

- Each lamp in this room is connected to its neighbour, creating a network of light that ripples out from a single point. Walk into the room and one lamp lights up, then another, until the entire room is pulsing. Multiple viewers create multiple light ripples.



**‘Inspiration doesn’t suddenly happen. We have a lot of specialists and when they work in teams they are co-thinking. They’re not only thinking of their own territories, but over boundaries, thinking together with other people’**



At first glance, teamLab’s HQ looks like any other software company. Spread over the top four floors of a squat, seven-story office building down a side street in the shadow of Tokyo Dome, it employs around 400 people – coders, designers, animators and developers – who sit together in near-silence at rows of desks, staring at screens displaying lines of code and spreadsheets.

“We can make applications, websites, back-end systems, databases,” Takashi Kudo says, dismissively. Clients include airlines, events companies, retailers and government departments. But this is a company with a split personality. On the walls, television screens glow with vibrant animations of cherry blossoms; propped up against a wall another row of screens displays a stylised animation of farmers toiling in rice paddies; at the end of yet another row of desks, a small room is packed floor-to-ceiling with circuit boards, wires and scraps of

metal – the workshop where teamLab hacks together the hardware for its innovative art. Despite being the mainstay of its business, the software development operation at teamLab feels more like a side note.

“From the very beginning, we made digital creations and applications at the same time,” Kudo says. “For us, there was no boundary between art and applications.” In practice, that means the same person who spends one week working on 3D animation for a software application might spend the next week animating koi carp and flowers that will be projected on to the surface of an artificial lake, or butterflies that will dance across the walls of an art gallery. As many as 30 employees at a time can be seconded on to a single art project, Kudo explains. At the beginning, teamLab’s software development subsidised its creative output. However, now that balance is starting to shift.

Above: TeamLab’s art collective is just one department inside its web-development company



In a small, glass-fronted side office, the window is propped open to let in the humid air. On the wall outside, teamLab's logo is engulfed by a chain of stylised, red-and-black fish that leap from floor to ceiling. The carpet is dotted with cartoons of flowers, trees, waves and stars. A clutch of employees sit around a table, laptops on knees, talking quietly. Kudo takes a drag on a cigarette and pours a glug of milk into a coffee cup. "We're an art collective, but at the same time we call ourselves an ultra-technologists group. It's kind of a joke," he says with a laugh that chirps and crackles. "There is no point in individual names. I have no interest in my job name." His business card lists him as communications director, but in reality Kudo sees his work as like "oxygen" – because nobody can communicate without oxygen, he says.

Dressed in a long black coat, creased grey T-shirt and baggy black trousers, Kudo has a near-perpetual smile and defies description. In his twenties, he lived on the streets of Damascus and Beirut for six years, making what money he could as a fire-breather. "This one is from 2002, when I left Japan," he says, grabbing a long, matted ponytail that's draped over his left shoulder. "I lost half of it – it already died and suddenly it fell off."

In 2010, after a brief stint as a video-game magazine editor in Stockholm, Kudo felt the urge to return to Japan. When he did, he looked up Toshiyuki Inoko, an old friend and the mercurial founder of teamLab. Inoko, also 40, founded teamLab with four university friends. "I had never worked for a Japanese company, this was my first," says Kudo, who is now settled in Japan with a wife and children.

While Kudo is gregarious and energetic, Inoko is guarded almost to the point of being aloof. He types on his laptop, excitedly showing me YouTube videos of teamLab's recent exhibitions. "People can live inside art, it's not just decoration. That's what we want to do," he says, gesturing at a video of an installation that connected people's smartphones to a series of outdoor projectors. It's typical of teamLab's work: an ingenious mix of technology and design that lets people beam epic-scale *kanji* symbols and flowers on to a nearby building. With a flick of a finger on a screen, Kudo explains, the mundane was made magical.

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hen I visit teamLab's offices, Inoko is in Singapore,

overseeing the opening of an exhibition at the city-state's National Gallery. For the piece, titled *Homogenizing and Transforming World*, teamLab has filled a vast room with 150cm-wide balls. In the middle of each is a tiny colour-changing light and a sensor, with all the balls in the room connected to one another. When someone walks into the room and pushes one ball on to the next, the colour of the first is passed on, creating a bumping, rippling effect. Fill the room with people and colours start changing in every direction. "It's the same concept as the internet: you can change the world, but other people can also change the world," Kudo says, as we wait for Inoko to join us on Google Hangouts.

When he appears on-screen, Inoko looks dishevelled. He frowns into the camera on his laptop and puffs lazily on a cigarette. Sat on the balcony of his hotel, the hum of traffic fills the long, thoughtful pauses he takes between utterances. "The process to create is based on diversity," he says after two minutes of silence. "Normally when you create something you can only use it once, but through the process we find many things. This is a key value of teamLab. At teamLab we are making art, but through our creativity, we always try to find a way to reuse intelligence."



Diversity, process and intelligence are important mantras for Inoko. He describes teamLab's creative output as the result of what he calls "co-intelligence" of working in teams to take one person's concept and turn it into a sprawling work of art. It's a process that leans heavily on Inoko's degree in physics and the scientific process: identify a problem, hypothesise and repeat until you discover a new kind of artistic creation. teamLab's work is brought about by a coalescence of art and technology. The company hacks together sensors, projectors, screens, animations and lights to create dazzling displays in which the technology effortlessly fades into the background. "Every day we create something and through the process we build up co-intelligence. Then we can make another artwork. And another concept," Inoko says, pausing thoughtfully once more. "Inspiration doesn't suddenly happen. We have a lot of specialists and when they work in teams they are co-thinking. They're not only thinking of their own territories, but over their boundaries, thinking together with other people."

Above and left:  
TeamLab's office  
is littered with  
the detritus of  
previous projects

The secret to teamLab's success is its creative process. "Sometimes Toshi will smell something," Kudo says, using his affectionate nickname for Inoko. "At that stage he can't explain by words or by drawings. So we'll talk in teams and ask questions and start to make some kind of image. We try to make a prototype. It's trial and error, again and again and again." It's a way of working, Kudo continues, that's inspired by the company's software development work: identify a problem and then work collaboratively to find a solution. "Most of the time we have exhibitions, so we have deadlines. We make schedules, so next Monday we have a review and the week after we have to make a prototype." And by applying the procedural rigour of its software development work to its creative output, teamLab has inadvertently created a system for artistic innovation. "It's very unique," says Kudo. "There are not so many companies like this."

Below: TeamLab founder Toshiyuki Inoko photographed by WIRED, August 2017

Right: Employees gather for WIRED on the roof of teamLab's Tokyo headquarters

**'We want to put people inside this world. They should enter with their full bodies. There shouldn't be any boundaries'**

**F**or all Inoko's thoughtfulness and sincerity, there remains an obdurate childishness – like an ill-tempered Peter Pan. "He never changed from when he was a university student. He's always thinking quite a lot," Kudo explains when we meet again later. "He thinks from the beginning. It's very adorable, at least for me."

Having founded teamLab with his university friends, Inoko has shaped the company into something of an eccentric family. "He doesn't have boundaries between private and company life. That's a very big difference between us. I have a private life, a family. He wants to make teamLab like a family. He works quite hard because he wants to be with friends as long as possible." Structurally, Inoko explains that teamLab's immersive approach to art is rooted in a crucial difference between Japanese and western art: perspective. "Drawings in western culture see the world through a camera lens. It's a fixed perspective. In Japan, the organisation of the space is free," he says, comparing conventional western art to watching a TV show, where the onlooker

only ever gets the perspective forced upon them by the artist. "In a Japanese way of drawing, you can be inside these worlds." In some traditional Japanese painting, the perspective trick pioneered during the Renaissance is ignored, with objects and characters appearing on a flat plane, allowing the viewer to position themselves anywhere within the art. I ask if this is a source of inspiration for Inoko. After six minutes of sitting in silence, frowning into the middle distance, he answers. "We want to put people inside this world. They should enter with their full bodies, there shouldn't be any boundaries," he says, defiantly.

Through its clever use of technology, teamLab is able to break down these boundaries further. In February 2017, at the Moody Center for the Arts at Rice University in Houston, Texas, teamLab covered a room in projections of flower blossoms. Over a period of one hour, the room goes through an entire year: flowers grow, bud and blossom, before wilting, shedding their petals and fading away. Stand still, and the

flowers bloom vigorously, but move around and the flowers nearby die more quickly. The work is rendered in real time, allowing it to respond realistically when someone walks into the room. It's a clever technological trick that lets the viewer not just step inside the art, but have a profound effect on it. In doing so, Inoko hopes art can change people's perspectives.







But it isn't just artistic boundaries that drive teamLab's mission. Beyond gallery walls, Inoko is alarmed by an increasingly isolationist world. "All over the world, people are agitated. They try to make boundaries," he says. "We believe that a world with no boundaries is very beautiful. If, through our installations, people can have that experience, maybe we can change their minds. Art can do that."

Art's ability to change people's perspectives is at the core of teamLab's goal of creating utopias, no matter how fleeting. "The real world is filled with disgusting and ugly things. In art, we can express a beautiful world. The world is beautiful," he says. The harshness of reality is clearly something Inoko struggles to come to terms with.

As he sits in silence once more, eyes half-closed in thought, I wonder if he's trying to will his mind into the refuge of teamLab's art. And that, right there, is the essence of Inoko's work: escaping reality through art. "We want to make a city itself become art," Kudo says. "People can live inside artworks. Art can change the relationships between people." The installation on Kyushu island, he continues, is an example of that. "To make physical theme parks you need big spaces, but we can make our artwork anywhere. We're very adaptable. Our paint is light and our canvas is everywhere." ■

*James Temperton is WIRED's digital editor*

BY NICHOLAS THOMPSON

INSTAGRAM'S KEVIN SYSTROM

WANTS TO CLEAN UP

THE &#x26;\$@! INTERNET

# TAMING THE TROLLS

Taming  
the  
trolls

KEVIN SYSTROM (*right*), the CEO of Instagram, was at Disneyland last June when he decided the internet was a cesspool he had to clean up. His company was hosting a private event at the park as part of VidCon 2016, an annual gathering that attracts social-media virtuosos, and Systrom was meeting some Instagram stars. They were chatting and joking and posing for one another's phone cameras. But the influencers were also upset. Instagram is supposed to be a place for self-expression and joy. But who wants to express themselves if they're going to be mocked, harassed and shamed in the comments below a post? Instagram is a bit like Disneyland - if every now and then the seven dwarfs hollered at Snow White for looking fat.

PHOTOGRAPHY: ART STREIBER. ILLUSTRATION: ZOHAR LAZAR







fter the chat, Systrom, who is 33, posted a Boomerang video of himself crouched among the celebrities. It's an ebullient shot of about 20 young people swaying, waving, bobbing and smiling. In the lower right corner, a young woman bangs her knees together and waves her hand like she's beating eggs for a soufflé.

The comments on that post started out with a heart emoji, a "Hooooooo" and "So fun!". Soon, though, the thread, as so often happens online, turned rancid, with particular attention focused on the young woman in the lower right. "Don't close 🙌 wait 🙌 just 🙌 wait 🙌 OPEN 🙌 them leg 🙌 baby", "cuck", "succ", "cuck", "Gimme ze suc". "Succ4succ". "Succme". "Go to the window and take a big LEAP out of it". A number of comments

included watermelon emoji, which, depending on context, can be racist, sexist or part of picnic planning. The newly resurgent alt-right proclaimed over and over again that "#memelivesmatter". There was a link in Arabic to a text page about economic opportunities in Dubai. Another user asked Systrom to follow him – "Follback @kevin". And a few brave people piped up to offer feedback on Instagram's recent shift to ordering posts by relevancy rather than recency: "BRING BACK THE CHRONOLOGICAL ORDER!"

Systrom is a tall, lean man with a modest bearing. His handshake is friendly, his demeanour calm. He's now a billionaire, but he doesn't seem to play the alpha male games of his peers. There is no yacht; there are no visits to the early primary states; there is no estranged former partner with an NDA. Systrom's personal Instagram feed is basically dogs, coffee, bikes and grinning celebrities. A few years ago, Valleywag described his voice as "the stilted monotone of a man reading his own obituary", but he's become smoother of late. If he has a failing, his critics say, it's that he's a sucker: he and his co-founder, Mike Krieger, sold Instagram to Facebook too soon. They'd launched it a few years after graduating from Stanford, and it went into orbit immediately. They got \$1 billion (£781m) for it. Snap, which spurned an offer from Facebook, is now worth roughly \$17 billion.

Systrom takes pride in this reputation for kindness and considers it a key part of Instagram's DNA. When the service launched in 2010, he and Krieger deleted hateful comments themselves. They even personally banned users in an effort Systrom called "pruning the trolls". He notes that Krieger "is always smiling and always kind", and he says he tries to model his behaviour on that of his wife, "One of the nicest people you'll ever meet." Systrom really does want to be the sunny person on display in @kevin's feed.

So when Systrom returned from VidCon to Instagram's HQ in Menlo Park, he told his colleagues that they had a new mission. Instagram was going to become a kind of social-media utopia: the nicest place online. The engineers needed to head to their whiteboards. The next image he posted on Instagram, just before Independence Day, was of some sumptuous home-made pretzels.

"Nice buns like yur mum," @streamlinedude commented. "If you stop reading this you will die," added @Juliamenzi. She, or it, then said, oddly, "If u don't post this on 20 photos I will sleep with you forever."

technology platforms, the conventional wisdom now goes, are not neutral. Their design and structure encourage certain behaviours, and then their algorithms control us even more. We may feel like we're paddling our own boats, but the platform is the river and the algorithms are the current.

As the CEO of a service with more than 700 million users, Systrom recognises that he's something like the benevolent dictator of a country more than twice



the size of the US. The choices he makes affect the lives of all his users – some of whom are insecure teens, some of whom are well-adjusted adults, some of whom are advertisers, and some of whom are pop singers dealing with an infestation of snakes.

In mid-July 2016, just after VidCon, Systrom was faced with just such an ophiological scourge. Somehow, in the course of one week, Taylor Swift had lost internet fights with Calvin Harris, Katy Perry and Kim Kardashian. Swift was accused of treacherous perfidy, and her feed quickly began to look like the Reptile House at London Zoo. Her posts were followed almost entirely by snake emoji: single snakes, snakes piled on snakes, snakes arranged numerically, snakes alternating with pigs. And then, suddenly, the snakes started to vanish. Before long, Swift's feed was back to the way she preferred it: filled with beautiful images of her and her beautiful friends in beautiful swimsuits, with commenters telling her how beautiful they all looked.

This was no accident. Over the previous weeks, Systrom and his team at Instagram had quietly built a filter that would automatically delete specific words and emoji from users' feeds. Swift's snakes became the first live test case. In September, Systrom announced the feature to the world. Posters could click a button to "hide inappropriate comments", which would block a list of words the company had selected, including racial slurs and words like "whore". They could also add custom keywords or even custom emoji, like, say, snakes.

The engineers at Instagram were just getting started. In October, the service launched a series of tools that roughly model what would happen if an empathetic secondary-school guidance counsellor hacked your phone. If you type in the word "suicide", you'll be met first with a little box that says, "If you're going through something difficult, we'd like to help." The next screen offers support, including a number for a suicide-prevention hotline. Two months later, in December 2016, the company gave users the ability to simply turn off commenting for any given post. It's for those times when you want a monologue, not a conversation.

A cynic may note here that these changes are arguably as good for business as they are for the soul. Advertisers like spending money in places where people say happy, positive things, and celebrities like places where they are less likely to get mocked. Teenagers will make their accounts public if they feel safe, and if their parents don't tell them to get off their phones.

Still, talking to people at the company, from Systrom down, you get the sense that this is a campaign felt in the company's heart, not just in the pocket. Nicky Jackson Colaco, Instagram's director of public policy, speaks of her own children and the many teenagers around the world whose first experience with the swamp of social media is on Instagram. "I think what we're saying is, we want to be in a different world," she says.

But Instagram can't build that world with relatively simple technical fixes like automated snake-emoji deletion. So, even amid a bevy of product launches in autumn 2016, Instagram's engineers began work on something much more complex.



**rying to sort rubbish from** reason on the internet has long been a task for humans. But thanks to artificial intelligence, the machines are getting better at the job. Last June, around the time Systrom visited VidCon, Facebook announced that it had built a tool to help computers interpret language. The system, named DeepText, is based on a machine-learning concept called word embeddings. When the system encounters a new word, it tries to deduce meaning from the other words around it. If a watermelon emoji is always surrounded by right-wing memes, that means something. The more data the classification engine analyses, the

smarter it gets. Like us, it learns over time; unlike us, it doesn't get exhausted or depressed reading the word "cuck" 72 times in a row.

One way to think of DeepText is that it's like the brain of an adult whose entire memory has been wiped and who will now devote themselves to whatever linguistic task you assign. Facebook essentially has a freezer filled with these empty brains, which it gives to its engineering teams. Some are taught to recognise whether a Messenger user needs a taxi; others are taught to guide people selling bikes on Marketplace.

After learning about DeepText, Systrom realised his engineers could train it to fight spam on Instagram. First, though, like a child learning language, it would need some humans to teach it. So Systrom gathered a team to sort through massive piles of bilge on the platform. They labelled comments as spam or not spam and then fed everything into DeepText. The machines studied the categories and came up with rules to identify genuine economic offers in Dubai and whether it's a friend or a bot who wants a follow-back. Once DeepText was able to classify spam with sufficient accuracy, the company quietly launched the product in October 2016.

Next, Systrom had an even more complicated idea: what if Instagram could use DeepText to knock out mean comments? Forget about the succs and the follbacks. Could the AI learn to filter out more ambiguous content? "Go to the window and take a big LEAP out of it" is definitely hostile, but it doesn't include any particularly hostile words. "Don't close 🍌 wait 🍌 just 🍌 wait 🍌 OPEN 🍌 them leg 🍌 baby" is gross. But can a computer tell? "Nice buns like yur mum" is rude and off topic. But it could be charming if it came from a childhood friend who truly appreciated your mother's German pretzels.

Other social-media companies had worked to filter spam, but Instagram's new plan to make the whole platform kinder was vastly more ambitious. Systrom told his team to press ahead.

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**Technology platforms encourage certain behaviours. We may feel we're paddling our own boats, but the platform is the river and the algorithms are the current**



Nicky Jackson Colaco, Instagram's director of public policy: "I think what we're saying is that we want to be in a different world"

**Instagram is a relatively small company.** It has only about 500 employees – roughly one person for every 1.5 million active users. And the team that has trained the machines to be kind is tiny too. When I visited in late June, there were about 20 people surrounded by scattered boxes of sanitising wipes. Everyone seemed young; the group seemed diverse. A woman in a head scarf sat near a white guy in a Tim Lincecum jersey. Their job is to pore through comments and determine if each one complies with Instagram's Community

Guidelines, either specifically or, as a spokesperson for the company says, "in spirit". The guidelines, which Instagram first drafted in 2012, serve as something like a constitution for the social-media platform, and there's a relatively simple 1,200-word version available to the public. (In short: always be respectful and please keep your clothes on.) The raters, though, have access to a much longer, secret set of guidelines, and they use it to determine what's naughty and what's nice. There are dozens of raters, all of whom are at least bilingual. They have analysed more than two million comments, and each comment has been rated at least twice.

Nuance is crucial even when dealing with the most offensive words. "If you're using the N-word as a slur, then it's not allowed in our platform," says James Mitchell, Instagram's director of content operations, who manages the raters. "The exceptions are if you're





using the word in a self-referential way or you're recounting a story or an experience you had where you were discriminated against."

After the raters had sorted through the data, four-fifths of the text they classified was fed into DeepText. The machines studied all the comments, looking for patterns in the data classified as good versus the ones classified as bad. Eventually, Instagram's engineers, working with DeepText, came up with a set of rules for identifying negative comments, based on the content of the posts and factors such as the relationship between the author and the commenter. The company also uses a metric that the engineers, internally, call a "karma score", which captures the quality of the user's posts. The rules were then tested on the one-fifth of the data that hadn't been given to DeepText, to see how well the machines matched the humans' evaluations.

The machines give each comment a score between zero and one – say .41 or .89. The higher the score, the worse the comment, and above a certain threshold, the comment gets zapped. Instagram has tuned the system so that it has a false-positive rate of one per cent, meaning that one per cent of the comments deleted by the machines will be ones the humans would have waved along.

Sometimes using a machine can feel like the purest way to solve a problem. Humans are boiling stews of biases and contradictions, and computers don't have emotions. But machines are only as good as the rules built into them. Earlier this year Rob Speer, the chief scientist of text-analytics company Luminoso, built an algorithm based on word embeddings to try to understand the sentiment of text posts. He applied the algorithm to restaurant reviews and found, oddly, that Mexican restaurants seemed to do poorly. Stumped, he dug into the data. Ultimately, he found the culprit: "The system had learned the word 'Mexican' from reading the web," he wrote. And on the internet, the word "Mexican" is often associated with the word "illegal", which, to the algorithm, meant something bad.

When I tell Systrom this story, he responds quickly, "That sounds horrible." He then points out that his ratings will be based on the judgements of his human raters. But might the raters be biased in some way? What if the guy in the Tim Lincecum jersey is really sensitive to nasty things said to tall women but not to short ones? What if he thinks that #memelivesmatter is hateful? Or empowering? The cumulative biases of the people in that room will shape the biases of a filter that will mediate the world for 700 million people.

The product debuted in late June, and so far user response seems reasonably positive. Few people, in fact, have noticed. The filter isn't perfect, though. It has trouble, for example, with words that mean different things across cultures. It stopped sentences that used the word "fag" in a way that clearly referred to the British slang for cigarettes. It stopped the sentence "You need to check your BMI index" when it came from a new account but not from a verified one. It also had trouble recognising Kanye West lyrics. Every line in this sequence got banned when it was put through: "For my southside niggas that know me best/I feel like me and Taylor still might have sex/Why, I made that bitch famous." It was entirely at ease, however, with more creative Kanye insults like "You left your fridge open/Somebody just took a sandwich."

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**The filter isn't perfect, though.**

**It stopped sentences that  
used the word 'fag' in a way  
that clearly referred to  
British slang for cigarettes**



**ne big risk for Instagram is that** the filter will slowly change the tenor of the platform. Instagram is mostly pictures, of course, but what happens if genuine arguments and thoughtful criticism start to appear less frequently? The best ideas don't always come from being positive and friendly. Instagram, as is often noted, wouldn't exist without the iPhone. And Steve Jobs was known to say a few things of the sort that might not get by the filter. It's possible that the world Systrom is trying to create may not just feel nice – it may feel sanitised. It may feel like, say, Disneyland.

When he announced the product in late June, Systrom published an image composed of letters in the shape of a heart and explained what he was doing. The response was mostly positive, rapturous almost. "How great it is!!!!!!", "👍👍👍", "Amazing 🙌", "Thank you!", "👍👍", "Bravo!!!!".

But some critical comments didn't bother the filter. There were complaints, again, about the non-chronological timeline. Other people just thought the whole thing odd. But a few readers, including someone named @futurestrader, noted the most germane concern: "While I do agree IG and social media in general has become a cesspool of trolling, I hope this doesn't push us further down the line of sensorship [sic] in general with comments and ideas that ain't agreed with." The line of censorship in Silicon Valley – what it is and what it isn't – is a crooked one, or at least a blurry one. The government has constitutional limits on its right to censor you, but private platforms do not. Still, the idea of free speech has long been a central concern in Silicon Valley. The hacker ethic, the loose code that early computer programmers embraced, prized the free flow of information. In 2009, Facebook declared its mission to "make the world more open and connected". That was the same year that the thwarted Green Revolution in Iran was briefly called the Twitter Revolution. "We wanted to maximise the number of opinions online, because it was our belief that more speech was better speech," Jason Goldman, a member of the founding team at Twitter, told me. In 2012, an executive at the company referred to the platform as the "free speech wing of the free speech party".

Now that period in Twitter's corporate lifetime looks like a moment of naïve idealism: the creation of young men who didn't understand the depths to which sexism, and maybe even fascism, lurk within the human id. Back then, calls for free speech came from people who wanted to bring down dictatorships. Now they seem to come from people demanding the right to say racist stuff without being called racist.

And so the notion of free speech is shifting at the companies that run the internet. Facebook had a reckoning after false stories on its News Feed – free speech, in a sense – may have helped elect Donald Trump. Perhaps not coincidentally, the company changed its mission statement in June 2017. Now Facebook wants to “give people the power to build community and bring the world closer together”. The original mission statement had echoes of James Madison. This one has echoes of a Coca-Cola ad.

To Systrom, it’s pretty simple: freedom of speech does not mean the freedom to shitpost. His network isn’t a public square; it’s a platform people can choose to use or not. When pressed on the matter, he asks, “Is it free speech to just be mean to someone?” Jackson Colaco makes the same point more sharply. “If toxicity on a platform gets so bad that people don’t even want to post a comment, they don’t even want to share an idea, you’ve actually threatened expression.”

Her comment raises a new problem, though: how exactly do you know when restricting speech helps speech? When is less more and when is less less? These are not questions with easy answers, and Systrom brushes them aside by noting that Instagram is really only targeting the very worst comments. “We’re talking about the lower five per cent. Like the really, really bad stuff. I don’t think we’re trying to play anywhere in the area of grey.”

**decade ago, Tristan Harris and Mike Krieger** both studied at Stanford’s famous Persuasive Technology Lab, where they learned how technology can shape behaviour. Together, the two of them mocked up an app called Send the Sunshine, a rough crayon sketch of what Instagram is working on now. The app would prompt friends in sunny places to send photographs to friends in places with gloomy weather.

Harris spent several years working at Google, and he now runs a non-profit called Time Well Spent, from which he has launched a battle against social media. His weapon of choice: long-form journalism. He started gaining significant attention after being profiled in *The Atlantic*, which called him the “closest thing Silicon Valley has to a conscience”. His stature grew further after a segment on *60 Minutes* and then an interview on a Sam Harris podcast titled “What is Technology Doing to Us?”. “Everything they do is about increasing engagement,” he tells

me, referring to the big tech companies. “You can just substitute ‘addiction’ for ‘engagement’, and it means the same thing.”

Harris has partnered with an app called Moment, which measures the amount of time people spend in the other apps on their phones, and then asks them whether they’re pleased with that use. Ninety-nine percent of users are happy that they spend time in Google Calendar, and 96 per cent are happy with the time they spend on Waze. More than half of all users, though, express unhappiness with the time they spend on Instagram, which averages about 54 minutes a day. Facebook does even worse – it’s the app people feel the third worst about using, trailing only Grindr and Candy Crush Saga.

When I mention Harris in an interview, Systrom smiles and bats back the critique before it has been fully offered. “Sorry, I’m laughing just because I think the idea that anyone here tries to design something that is maliciously addictive is so far-fetched. We try to solve problems for people, and if that means they like to use the product, I think we’ve done our job well.” The two Stanford classmates fundamentally agree on one really important thing: the way people use technology can be quite unhealthy. Harris, though, wants companies to “stop hijacking people’s minds for the sake of engagement”. Systrom wants the engagement to include more sunshine.

After launching the comment filter in late June, he got to work on a related task: elevating high-quality comments in users’ feeds. Systrom wouldn’t say exactly how he’ll measure quality, but the change will roughly be like when the company re-sorted the main feed based on relevancy, not chronology. The idea is to accelerate something called the mimicry effect. When people see others saying nice things, they say nice things too. The contractors in the headscarves and Lincecum jerseys may soon be turning their attention to something new.

Systrom’s grand ambition isn’t just to fix Instagram. His first goal is to clean up the platform he runs. But, at a time when our national conversation gets darker by the day, he also wants to show the rest of the internet that toxicity isn’t ineluctable. “Maybe trying sends a signal to other companies that this is a priority, and starts a conversation that we should all be having about creating safe,







James Mitchell, Instagram's director of content operations, oversees a team of in-house raters who have analysed more than two million comments

inclusive online communities, not only for our kids but for our friends and families," he says. "I think that will be success."

When pressed on whether his ultimate goal is to make Instagram better, or in some subtle way to make humans better, he demurs: "I actually think it's about making the internet better."

Is a calmer, kinder internet a better one? Maybe. Instagram, fully filtered, isn't going to knock down dictatorships. And maybe it won't even be that much fun. There's a certain pleasure in seeing Swift's perfectly curated summer soiree interrupted by a green snake emoji. Still, it's hard to make the counterargument – particularly in the era of Trump, and particularly on a service used by so many teens – that the internet should be meaner.

The point may have been proven soon after the product launched, in mid-July, when tragedy struck Instagram. Systrom's close friend,

Joy-Vincent Niemantsverdriet, one of the company's senior designers, died in a swimming accident. Instagram is mostly a dreamscape of lives that seem better than the lives we actually live. But the world has a way of breaching the barriers we build around ourselves. Less than a week later, a distraught Systrom posted a tribute to his former colleague: "JV stood for everything IG stands for. He stood for craft, showing kindness without expectation of gain, and looking at the world through a lens of curiosity."

Whether because the filters work, or because humans can be empathetic sometimes, even online, there wasn't a single snarky line or joke in the first few days. Just sympathy, sadness and even insight – with no one joining to shout it down. ■

*Nicholas Thompson is editor-in-chief at WIRED US*

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**'If toxicity on a platform gets so bad people don't even want to post a comment, they don't even want to share an idea, you've actually threatened expression'**

# fas











# Inside the Speedfactory, adidas's new weapon in the race for sneaker supremacy

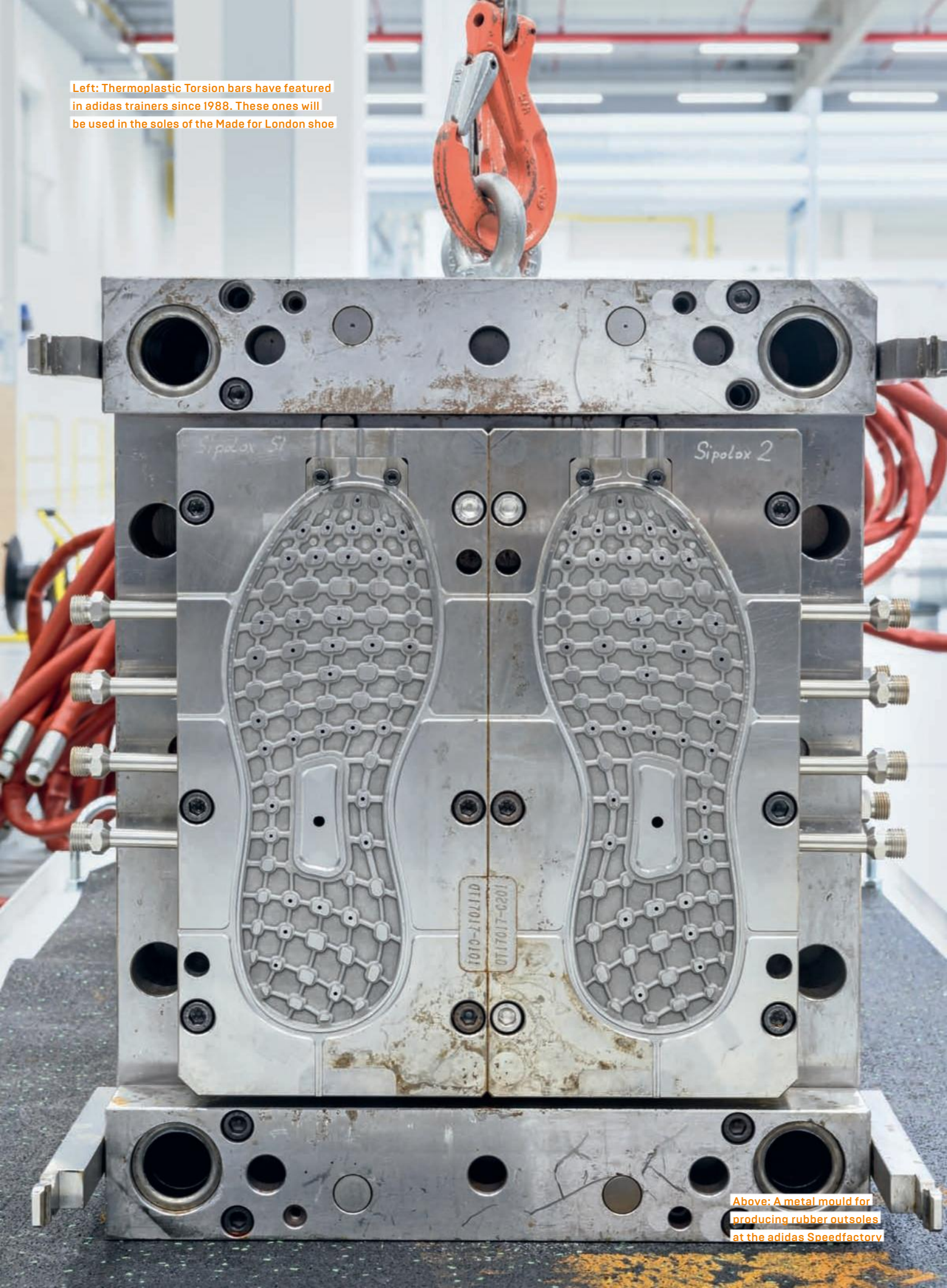
By Rowland Manthorpe

Photography:

Alastair Philip Wiper



Left: Thermoplastic Torsion bars have featured in adidas trainers since 1988. These ones will be used in the soles of the Made for London shoe



Above: A metal mould for producing rubber outsoles at the adidas Sneedfactory

# A pair

## of adidas Made for London trainers

sit on a powder-blue tray table the size of an A3 sheet. The shoes don't look like much – but then they wouldn't, because they haven't been made yet. The scant ingredients include two kinds of spooled thread, three cups of white plastic beads and a couple of rolls of green tape. It's like coming across a Longhorn, then hearing that, this time tomorrow, it will be a Chesterfield sofa.

"In Asia today, it takes between 90 and 60 days to turn these materials into a product," says Gerd Manz, adidas's vice president of technology innovation. "Today, if we're ambitious, we can go from here to final product within... Uli?"

Manz, a tanned, square-jawed 45-year-old who wears his black adidas T-shirt tightly tucked into his blue jeans, looks over at Ulrich Steindorf, the sportswear giant's gangly senior director of manufacturing.

"Days, I would say," Steindorf replies. "There are some production related settings..."

"Within a day," says Manz firmly.

"Within a day," repeats Steindorf, "you can make a shoe."

As Manz speaks, an orange robotic arm the size of a small digger lifts into the air with a rhythmic hissing. Nearby, a digital laser cutter whirrs into place, using cameras to identify its target. It's a hot day and the air is stuffy, but inside the 4,600-square-metre warehouse all is calm. A few workers in black adidas polo shirts stroll across the polished plastic floor, pausing to tap at rubber-cased tablets.

This factory is very different from the vast, cramped workshops of Asia, where workers as young as 15 hand assemble 97 per cent of the 360 million shoes adidas produces each year. But the most remarkable thing is its location: we're in Bavaria, just an hour's drive from the small German village where adidas founder Adolf "Adi" Dassler began making sports shoes after his return from the first world war.

Adidas is building a similar site in Atlanta, Georgia, and "seriously consid-

ering" further sites, including London. When Atlanta starts production at the end of 2017, the two factories will churn out a million pairs of shoes a year. What's more, thanks to robotic flexibility, there's the possibility that every single one could be tailored to taste and fit. "It's the future of shoemaking," says Manz. Adidas calls it the Speedfactory.

Over the past 40 years, the majority of shoe production has migrated east in search of cheap labour. For the Speedfactory, it has returned home.



## Summer, 2014. In Rio's Maracanã

Stadium, Mario Götze raced through in his adidas kit to slot an adidas ball past the adidas glove of Argentina's Sergio Romero and win the FIFA World Cup for Germany, adidas's national team. Sporting success, however, concealed a sombre outlook for the brand with three stripes. Away from the football field, adidas was losing.

Most concerning were the firm's struggles in the crucial US market, which accounts for more than 40 per cent of the world's sportswear sales. Lagging behind cooler, more confident Nike, as adidas had for decades, was bad enough. Now, after several years of underwhelming shoes and unlucky endorsements, it fell back even further, slipping below Under Armour for the first time, as annual sales slumped 23 per cent to \$1.1 billion (£859m). (By comparison, Nike, who made Götze's World Cup-winning boots, had sales of \$8.9 billion in the same period; as one headline put it, "Under Armour is beating adidas in the race to eat Nike's dust".) If adidas was going to compete, something had to change.

"Our two main competitors are constantly reinventing the model," the firm's new North American head,

Mark King, admitted to *The Wall Street Journal*. "We just have to move faster."

Inside adidas, speed was on everyone's lips. "If you want to be new you have to be first," says creative director Paul Gaudio. "We were a bit more measured. We contemplated and pondered the perfect path." Gaudio, a tattooed, silver-haired Pittsburgher who has worked for adidas on and off since 1991, took charge of the firm's design in September 2014 as part of an all-encompassing "reset", and immediately pushed his 650-person team to "get things out there". The mantra was made official in March 2015, when adidas CEO Herbert Hainer launched a five-year strategy promising to "transform the adidas Group into the first true fast sports company". But for all the symbolic changes – sports clocks in meeting rooms to stress that time was always ticking – one question remained unanswered: how could you speed up a business as sprawling and divided as adidas?

The problem was the very same outsourcing that had turned sportswear into a £300 billion industry. The shift was total: when Nike was founded in 1964, just four per cent of US footwear was imported; by 2014, it was 98 per cent. In order to take advantage of cheap South Asian labour, companies were forced to split themselves in half. Fifty thousand in-house staff handled design, development, marketing and sales; a million independently contracted labourers did the sweaty work of manufacturing. The two sides of the business talked, but in cordial, formulaic ways, like divorced parents trying to arrange childcare.

The most visible downside of the split were the conditions in the factories. But firms also faced the nagging, day-to-day difficulties that came from losing control over the manufacture of their own product: quality control; six-week waits for ocean shipments; piles of marked-down goods because forecasts were over optimistic. "They call it the supply chain, but a better name would be the sprawl chain," says ManMohan

Above: Blank Boost soles awaiting the assembly process. The hole in the middle is where a torsion bar slots in



# One question remained: how could you speed up a business as sprawling and divided as adidas?

And then we'll all wait until we deliver the product two years from now."

Adidas went after delays in its supply chain, cutting drag like a swimmer shaving their legs. It was a painful adjustment. "We were killing ourselves to get days out of the existing process by being more disciplined," says James Carnes, vice president of brand strategy. "Reducing waste time, ordering times. Getting days and weeks out of the buffer."

Carnes, a slight, black-clad American with a carefully razored blond haircut, joined adidas as a designer in 1995, but in the company's search for speed he found himself moved into strategy. "There were two parts," he says. "One was just speed: how do we get faster? And the other part of it was, what's the big revolution? How do we completely change the model we have? What would be a completely different alternative?"

That was when Manz stepped forward with a radical proposal.



**To understand shoe factories, it helps to think of a kitchen. Cooking turns a raw material (ingredients) into a product**

(food). There are two ways of doing this: change the ingredients' form (chopping, crushing, mixing) or change their chemistry (heating, cooling, combining with other ingredients). Chefs trying to come up with something new have to do one or the other. With the Speedfactory, Gerd Manz did both.

Manz joined adidas's Futures Group, the division responsible for new technology, in 1997. The first product he worked on was the Climacool breathable running shoe. An earnest, low-profile German with a degree in Leather Technology – his LinkedIn page has two listings: experience (adidas) and interests (adidas) – Manz might seem an unlikely radical. But, after ten years at adidas, he was increasingly frustrated with the group's focus on designing what he thought of as "gadgets".

Changes in other industries made those limitations especially grating. Silicon Valley firms such as Amazon and Apple weren't just releasing products, they were collecting data so they knew how to improve. Fast-fashion firms such as Zara had built factories in Europe to get clothes from sketch to store in as little as two weeks. But when Manz

Sodhi, professor of operations and supply chain management at Cass Business School in London. "You keep chopping operations into more granular pieces, so you shave pennies off, but now you're less flexible." Individual shoe sizes could only be made in lots of 20,000. Factor in design and the typical shoe took 18 months to produce.

Like so much else, this system was upended by the internet. Now shoppers could see what the rest of the world was sporting on social media, they weren't so interested in the shoes retailers had ordered wholesale nine months earlier. Fashions flared and died online in the time it took to get a prototype back from China. The world was leaving brands like adidas behind. "When we started our data initiative back in 2014, everybody was carried away by, 'Let's do trend analytics and predict which colour is hot,'" recalls Michael Voegelé, adidas's chief information officer. "And I said, 'Oh, that's fantastic guys. We'll do that.

**Below: Workers at the Bavarian Speedfactory hand-stitch the Made for Londons' uppers**



looked around him, there was nothing remotely comparable in the pipeline.

"We thought, goddammit, we're cooking in the same kitchen with the same ingredients as everybody else," he recalls. "All of our competitors have the same board with the same ten spices on it, and because we all go to the same suppliers and get the same catalogue, the only thing that changes is what we pick. So all the soups that come out of this kitchen taste the same, no matter what the brand."

Manz started to look for new ways of manufacturing. His opportunity arrived in 2009, when a representative from the giant German chemical producer BASF got in touch about a lightweight plastic with tiny bubbles of gas trapped inside, like a miniature tennis ball. The material was highly elastic – in tests, it sprang back to its original state much faster than equivalent substances – but BASF didn't know how it could be used. The representative showed Manz the plastic in its raw form of small white beads. "All we had from them were these Tic Tacs on the table," Manz says. "OK, how do you make a shoe out of this?"

The answer – arrived at after several years of tweaking, testing and designing – was to press 2,500 of the beads into a mould, creating a super-springy cushioning for the middle of the shoe. The resulting midsole, with its distinctive rice-cracker look, was the biggest trainer innovation since air cushioning. "It was so unique," Gaudio recalls. "You put it on your foot and instantly you could feel the difference." Adidas introduced it in February 2013 under the name Boost.

Inside the Speedfactory, Manz demonstrates how the Made for London's Boost sole is made. In a metre-tall glass case, a machine blows hot steam on to a mould. Then a robot with a vacuum pump on the end of its arm sucks the sole up and, moving with terrifying speed, deposits it in an exit slot. Manz picks one up. "They're still wet and warm," he giggles boyishly, holding it out. It's slick and bobbly and as warm as a human hand.

# Boost

**made Manz look afresh at the way** adidas made shoes. So did another technology he'd been working on: the robotic knitting method called Primeknit. Crucially, both processes not only produced new materials, but also combined previously separate operations. Whereas sports shoes were usually made from lots of separate pieces, Primeknit knitted the entire upper in one seamless whole. Manufacture and assembly were simultaneous.

At the same time, Manz experimented with "spider silk" manufacturer AMSilk's artificially produced fibres, which could be tuned to contain different properties on demand. He teamed up with Carbon, a Google- and General Electric-funded startup with a new version of 3D printing that used ultraviolet light to fix the shape of a design after it had been pulled, Excalibur-like, out of a vat of liquid resin. 3D printing had always been too slow, expensive and heavy to use in shoes. Now it seemed like it could finally be ready.

(The technology is not currently in use at the Speedfactory, but adidas says it will make 100,000 pairs of shoes with 3D-printed midsoles by the end of 2018.)

These technologies all had something in common: they were flexible. Existing mass production only functioned if it produced large batches of identical products. (This, in essence, is why restaurants have menus.) The new systems, which sat under the collective term of additive manufacturing, could create 20,000 shoes and each one would be different. To Manz, it felt like a start of a seismic shift.

"We started developing some of the processes and we thought, well, actually you could put them together and they would make a pretty damn good factory," he says. The cost per shoe would be higher, but the savings in time and materials could compensate. (Nike claims that Flyknit reduces waste by 80 per cent compared to cutting and sewing.) It would be hard, but it would be different. Above all, it would be fast.

The moment of decision came in 2015 at a meeting with two of adidas's most senior executives. The first phase of the Speedfactory was a laboratory-style test of the different machines. To build it, Manz wanted €2 million (£1.8m) [an adidas source put that number closer to €10 million]. "It was pretty steep," recalls Carnes, who watched on, nervously, as Manz made his pitch. "It was a big ask for a project they had no idea would work. And they agreed in the meeting. That was probably the coolest part." The money, however, came with conditions. Mindful of their own demand for speed, the board insisted the Speedfactory start production within two years.

Once, adidas might have hesitated, as it had over Primeknit, a technology it worked on for years, but released so slowly Nike ended up suing over breach of copyright. (A court eventually decided the two firms had come up with it at the same time.) Now, things were different. Adidas had Gaudio, it had speed – and, crucially, it had Kanye West.

The new era of adidas dawned on May 17, 2015, at the Billboard Music Awards in Las Vegas, when adidas collaborator West strode on stage to perform wearing a pair of pristine white Ultra Boosts. One viral image captured the moment: a shot of the rapper mid-leap, shoes flashing

'All we had  
were these  
Tic Tacs  
on the table.  
OK, how  
do you make  
a shoe  
out of this?'





Left: Vice president of technology innovation Gerd Manz, in a pair of adidas Made for Germany shoes

in the dry ice. Instantly, the trainers began to sell out online. "That was the moment where Boost left the pure realm of sports and crossed over into culture," says Gaudio. Kanye made that Boost famous. After years of irrelevance, adidas was cool again. Eight months later, the Speedfactory broke ground.

**The Speedfactory is housed on an** industrial park outside the medieval city of Ansbach. Above the front door, instead of the adidas logo, "Oechsler Motion" is spelled out in clumsy grey cursive. Oechsler Motion started as a button manufacturer in the 19th century. Today, it makes car parts across the world. Adidas hasn't stopped outsourcing, it's just brought it closer to home.

At every stage, the Speedfactory is both more and less than it seems.

Take automation: there are plenty of robots, sure, but also a good deal of old-fashioned manual labour. Next to the patching conveyor belt, a line of middle-aged women stitch uppers at sewing machines. After that, a man steams the parts into shape by hand.

"To be honest, it's difficult to find those kind of workers now because this industry barely exists in Europe," says Steindorf, who oversaw the hiring. Adverts for experienced stitchers turned up women who'd worked in shoe production before it moved to Asia 30 years previously. (To refresh their skills, Oechsler brought in a traditional cobbler.) But the other positions couldn't be filled, for the simple reason that the work involved wasn't done anywhere else.

The hope that technology might reinvigorate skilled manual labour is another reason people get excited about the Speedfactory. But while its jobs are better paid and have greater autonomy than their Asian equivalents, there are far fewer of them, making, at present,

#### HOW THE COMPETITION KEEPS IN STEP



##### NIKE

Nike has partnered with supply-chain experts Flex to double the speed of its production, a project it calls "Manufacturing Revolution". It's also teamed up with DreamWorks on animation software for shoe designers.



##### UNDER ARMOUR

In June 2016, the US firm revealed "Lighthouse", a 3,200-square-metre test lab filled with 3D printers, body scanners and automated assembly robots. The brand's new Architech range of shoes have 3D-printed midsoles.



##### PUMA

Adidas's historic rival has launched a pilot project to create a robotic "intelligent" warehouse. The shoe brand is working with German firm Magazino, whose Toru robots can pick and stack without human involvement.

# The closer a factory is to its consumer, the faster the product can be delivered

far fewer shoes. By 2018, the two Speedfactories will employ around 300 workers to produce one million shoes.

This is the politically unacceptable truth about reshoring, as the return of manufacturing from Asia is known: it doesn't bring back many jobs. Parkdale Mills, the largest buyer of raw cotton in the US, shut down in the 90s, killed by competition from China. Thanks to new textile machines, it reopened in South Carolina in 2010, producing 1.1 tonnes of yarn a week – but with 140 staff compared to more than 2,000 previously. Raspberry Pi's move from China to Wales created 30 jobs. Foxconn, which makes Apple products, has promised 13,000 new jobs for Wisconsin, but only with \$3 billion in government subsidies – roughly \$230,700 per employee.

In any case, production isn't moving that quickly. A recent Morgan Stanley report concluded that in five years' time, 90 per cent of sports shoes will still be made in Asia using traditional methods. Earlier this year, new adidas CEO

Kasper Rørsted told *The Financial Times* that large-scale reshoring was "a complete illusion". "And that goes for the entire industry, not just for adidas," he added.



**Seen up close, the Made for London** isn't nearly as customised as its name suggests. Adidas did consult five local runners on its design, but they were "influencers" rather than representative Londoners. (Together, the group, which included television presenter AJ Odudu and celebrity personal trainer Bradley Simmonds, had more than 250,000 followers on *Instagram* alone.) Some of their ideas made it into the final product: the green stripes on the upper; the choice of fabric; the reflective laces, which the Londoners insisted on for morning and evening running. But as the basic outline of the shoe had already been determined, making key design decisions simply wasn't an option.

The reason is simple: starting from scratch is hard. Visions of a sci-fi future where our shoes are all 3D printed to our exact physical specifications sounds cool – but adidas knows that in reality, it's not what most customers want. In 2000, it launched *mi adidas*, a website where customers could change the look of certain shoes before buying. People loved the idea, but in practice, they didn't use it. "Everybody has found the same thing," says Carlos Cordon, professor of strategy and supply-chain management at business school INSEAD. "People are willing to pay a bit more [for customisation], but not much more, and not that many."

Cordon's research shows that Nike's rival ID website accounts for less than two per cent of the American company's sales. And it makes sense. Customisation takes effort: most of the time, the generic option is just easier. (This is the other reason why restaurants have menus.) "I'm a designer and I wouldn't use our customisation, or anyone's," says Carnes. "It's overwhelming. Just give me what I already want."

What makes the Made for London significant is that, for the first time, each shoe is digitally unique – "named", as Manz puts it. They contain an NFC chip near the tongue; inside, each sole is sprayed with a QR code near the heel. The machines that make it are mapped and tracked with sensors so they can stream data about the operations.

Digitising production brings many benefits. One is quality control. Another is planning: if Manz's team want to prior-

itise an incoming order of Stan Smiths, or change the plastic on a shoe upper, they can simulate the process using the Speedfactory's "digital twin". "It's a factory in the web," says Manz. "Traditionally, we would just set [the production line] up and see what happens," says Steindorf. "With the digital twin you can simulate consequences."

But the benefit adidas anticipates most keenly is data. This is the vision of a product that sends back data about how it is being used: a shoe that behaves like an iPhone. With that, adidas could finally peer inside the black box of its own product. Do people wear it? If so, what do they like? Most importantly, from a commercial point of view: what do they want next? "If you think about this right now," says Carnes, "already our shopping experience is giving algorithmic recommendations, but they're still offering you something that was created two years ago. What we're creating with Speedfactory is now you can actually get a recommendation for something that doesn't exist." He describes how adidas might be able to "take all of the visual information that you've customised already [online] and deliver a shoe. Eventually, a pair of [running] pants. Without having to go into the detail of creating it and picking and choosing and all that stuff."

That vision won't be enabled by the Made for London's basic NFC chip and branded app. But in a small way it's already happening: in Russia, where adidas has more than 1,200 stores, it is using location and search data to manage stock. At present, store managers estimate which shoes and







sizes to order based on past experience, the way retailers have always done. With the new model, Carnes explains, “You can correlate what’s been ordered for a retailer with what we’re selling online in that area with other things, like who’s searching for which models.” Location data might show there are lots of basketball players in the area; knowing this, the store can order larger sizes, fresher styles. Adidas can, for once, move at the pace of the world around it.

The true reason for the Speedfactory is just that: speed. In today’s world, where you’re more likely to order a pair of Yeezys from the back of an Uber than in a store, the gap between wanting

**Above: The results of an early production run of limited-edition Made for London trainers**

something and expecting to have it has shrunk down to almost nothing. Companies working on the old 18-month supply chain are already behind. The last 40 years have seen commercial empires built on the cost savings produced by economies of scale. In this new world, what matters are economies of speed.

This is where the reshoring narrative goes wrong: for companies, what matters isn’t location, but distance. The closer a factory is to its consumer, the faster the product can be delivered – and despite being more expensive to make, today’s customer will pay more to have it sooner. (This, simplified, is the logic behind Amazon Prime.) And about those reshoring jobs: according

to Morgan Stanley, 45 to 50 per cent of the world’s athletic footwear is sold in Asia. Local manufacturing means being local to those shoppers too.

The Speedfactory – and those like it – are not so much about the return of jobs or the rise of automation. They are about manufacturing catching up to the speed of the internet.



**It’s Friday afternoon in the Speedfactory,** and the week’s last batch of Made for London is almost finished. The soles are moulded, the uppers knitted, patched and stitched. Now the parts just need to be put together.

In a factory in China, this would be an unpleasant task. To assemble shoes, workers there use glue. Wearing masks to protect themselves from the fumes, they apply several layers, then press the parts together and wait for it to dry. In the Speedfactory, that process is eliminated – because the Made for London is not glued, but welded by lasers.

The welder resembles a high-tech blacksmith’s forge. In a glass-fronted cabinet the size of a fridge, a yellow light surrounds a pair of upside-down trainers. The light fades, then glows again, brighter and red with heat. As the parts are effectively melted together, the smell of burning rubber fills the air. Then a burly, bearded man in a sweaty T-shirt opens the doors, takes out the shoes and sets them on a ledge.

The team gather around to admire their creation. “In China, it’s an imprecise process,” says Carnes. “This makes sure everything is lined up before they touch.”

Manz leans in and picks up one of the shoes. “It’s consolidating now.”

“It’s actually pretty stable at this point already,” Steindorf says.

“Very clean,” says Manz admiringly.

He puts it down. The trio turn away. But the Made for London isn’t finished just yet. Quietly, the bearded man takes the brand new shoe and does something only a human can do, something no robot is yet close to mastering. He turns it on its side and, with practised swiftness, threads in laces. ■

*Rowland Manthorpe is WIRED’s associate editor. He wrote about Margrethe Vestager in 05.17*

**Left: Primeknit allows adidas to create uppers from a single piece of material rather than multiple pieces of leather**





**DO YOU REALLY NEED RELIGION TO ATTAIN  
SPIRITUAL ENLIGHTENMENT? \_\_\_\_\_ MEET...**

# **THE COOL HACKERS**

**BY KEVIN GRAY. PHOTOGRAPHY: GREGG SEGAL**

Left: Mikey Siegel, founder of Consciousness Hacking MeetUp, at his co-hack house in San Francisco

11-17 \_ WIRED \_ 131

# IT'S 7.30PM

on a chilly April night in San Francisco. The Battery, a members-only club in North Beach that serves Silicon Valley's ruling elite, hums with grey-bearded founders, pink-cheeked CEOs, serial startup kids and their venture-capitalist quarry. A herd of young men in fleece indulge in \$1,400 (£1,080) whisky, then make their way to the roof deck, watched over by the bar's nautical décor: paintings of 19th-century steam ships and carved wooden figureheads. Though the club bans smartphone use after 6pm and forbids voice calls to "protect the relaxed atmosphere", a few stork-legged women float through, clutching their iPhones like little prayer books, texting and not-looking walking. The overall vibe is buzzy and self-affirming.

One flight up, in the club's library, two men pace a small stage. They cradle microphones TEDx-style, enlightening 200 or so people perched on velour ballroom chairs, tumblers in hand. "Most of us are living in a highly

distracted, over-stressed, ego-driven experience," says Jamie Wheal. Angular, with landscaped eyebrows and a methodic vocal cadence, Wheal lays out the central burden of our time: "No one built an off switch," he says. To self-soothe, "We rock Ambien on a nightly basis." We binge-watch Netflix, drink three whiskies a night and "jack off" to YouPorn 24/7. We swipe *Grindr*, join *Headspace*, and Fitbit away our anxiety in a desperate bid to keep up. "Everyone," he says sympathetically, "is trying to alter their consciousness."

The crowd is equal parts loose and rapt, some there to enjoy the show, others to listen for a new direction forward. "So one of the things to realise," says Wheal, as a chart titled "Altered States Economy" projects behind him, with the figure \$4 trillion (£3.1tn) at its centre, "is A, massive market. B, largely unintentional, this is hiding in plain sight."

In other words, getting out of our own heads, tweaking the diodes on

**'Most of us  
are living in a  
highly  
distracted,  
over-stressed,  
ego-driven  
experience.  
No one built  
an off switch'**



our emotions and consciousness, is a "Four-trillion-dollar opportunity for the entrepreneurial-minded". It is testament to an urgent need, but a fraught one. "How do we make this positive and not destructive, distracting and addictive?" he adds. "Can we help steer people toward their better angels and our collective nature in our search for these things?"

Silicon Valley has always sought to mix engineering with enlightenment. After it hacked our desktops, our phones and then our attention spans, it sought to hack our corporeal selves. First came peak performance (smarter, faster, stronger) then mindfulness (chillax, brah). Today, the new frontier





him on stage – he is the co-founder of the Flow Genome Project. With it, they map flow states, using open-source input from athletes, artists, academics and others. And they will tell you how to achieve it via training videos, newsletters and interactive apps – all for an initiation fee of \$697, then \$97 per year.

Both men are at The Battery tonight to promote and sell copies of their new book, *Stealing Fire*, one of a dozen they’ve written (individually) on peak performance. But unlike the others, this one is a user manual for hacking everyday nirvana. Much of it is based on the ancient Greek notion, and reports, of ecstasis (yes, ecstasy). That literally means to stand outside yourself, usually in a trance experience with God.

Their book is packed with neuroscience and imaging research that definitively locates ecstatic states in the human brain, along with nods to data on how to get there. None of it is more unusual – or more understated – than the three-page section on a former MIT roboticist who popularised the term “enlightenment engineering”. And though he has no app or video to sell, he turns out to be at the centre of evangelising for consciousness hacking.



**The morning after the Battery talk,** I wake up in a \$10 million mansion in the green, undulating canyons of San Carlos, 40 minutes south of the city. Outside the front door, at the bottom of a steep drive lined with cars, including a graffitied van, someone has parked a Tesla Roadster. Inside, mandalas and flip-flops cover the wood floors. Tacks hold Indian tapestries to the living-room walls. Junked hard-drive towers and monitors narrow the hallways. And the open-plan kitchen, as big as a yacht, bears signs directing you to the natural tea shelf and the composting bin.

Mikey Siegel pads into the kitchen wearing loose black jeans and rubber flip-flops. His angular head, which teeters atop his thin 178cm frame, is crowned by unruly black hair. A 35-year-old former MIT roboticist, Siegel founded the Consciousness

is consciousness hacking. Its goals are varied, its practitioners virtuously divided and its definitions fluid.

Its first wave came tumbling at us as biofeedback, meditation apps and micro-dosing. It crashed in the surf of sensory deprivation and DIY transcranial direct-current stimulation – sending small voltages across the skull with electrodes and a controller – to boost focus and reduce depression. It was driven, and still is, by a decade-old revolution in neurobiology and brain imaging that lets us look under the hood at mental and emotional states, figure out where they come from and how to get more of them using new tech.

That led to our next wave: pulling the neural triggers that can produce the same kind of enlightenment that lifelong meditators experience. Want an out-of-body experience? We have virtual-reality simulations for that. Want to be smarter and happier? You can learn to quiet your pre-frontal cortex – that inner critic – and access more of your brain’s attention-focusing norepinephrine.

Wheal’s gambit is this last bit. Along with Steven Kotler – the thin man with the grey Caesar cut next to

**Above: Mikey Siegel with his wife and occupants of the co-hack house engaged in virtual meditation. They are attached to the HeartSync machine, which monitors the group’s breath and heartbeat**

Hacking MeetUp group in San Francisco in 2013. It has since spread worldwide and now claims 15,000 members in 30 communities. He also helped found the Transformative Technology Conference. It's a mixer for technologists, futurists, entrepreneurs and venture capitalists trying to turn consciousness hacking into a multi-billion-dollar business on a par with the fitness industry.

Siegel is a sweet, nerdy guy. When he speaks, he sounds like a cross between a precocious college undergrad who just awoke to pot and Plato and a genius engineer with a gift for research recall. He and six others rent this co-hack house from a venture-capitalist friend who has decamped to another home a little closer to the Bay Area.

"This is not woo-woo stuff," says Siegel, leading me out to a stone patio lined with lilac and overlooking an impossibly green canyon. Like many people proselytising consciousness hacking, Siegel knows how squishy

it sounds to those outside the valley or beyond the research labs. He's quick to tick off a list of key Harvard and Stanford brain-scanning studies done on meditating Buddhist monks, showing increased neuroplasticity (a capacity to change) and deep, active neural correlates. "These are 30,000-hour meditators," says Siegel. "Their brains are profoundly different. Their experience of reality is profoundly different. They're not just a little bit happier." Taking a seat and drinking from a blueberry-and-cayenne smoothie, he says, breathlessly, "What does that mean if you can create the technology that makes that accessible to everyone? That's like, I don't know. It could alter all of humanity."

Siegel is the high priest of the movement. "I think I drink the Kool-Aid a little too much," he tells me at one point, to which a friend replies, "You become the Kool-Aid." His MeetUp group, which has 4,000 members, tackles topics such as quantifying bliss, dissolving the

boundaries between self and other, and hack dating: connecting with confidence. On Project Nights, startup founders pitch their prototypes. One night it included the LucidCatcher, a sleep band that stimulates your brain with small electrical pulses, supposedly letting you control your dreams. So you could, say, be riding a dragon, talking to a long-dead parent or having sex with a famous celebrity.

Though Siegel is hosting a sold-out MeetUp for 120 people tonight – \$10 per ticket or \$100 for an annual membership – he's as relaxed as a California surfer. "A lot of logistics get taken care of by other people these days," he says.

Siegel grew up in "a nice Jewish family" in Southern California. He earned a degree in computer engineering, then landed at Nasa's Ames Research Center, working on robotics. In 2006, he moved east to the MIT Media Lab and studied with social roboticist Cynthia Breazeal. While

**Below: party guests are guided through a group meditation session at a Consciousness Hacking MeetUp hosted by Siegel in San Francisco. Opposite page: a guest tries light therapy**





there, he worked under a research grant for Audi, focusing on persuasive robotics – figuring out how to give a car a social interface that would help it influence driver behaviour,” he says, “in a way that felt good.”

Then, in 2011, he moved to a now infamous startup called Theranos. Siegel, who is verbose on most topics, is vague about what he did there. But it’s possible that in such a new company, where titles and responsibilities overlap, it really is hard for him to pin down. “I don’t want to say I was like a rogue,” he says, “but I did everything. I did a lot of prototyping, designing, building and testing things,” and reporting directly to its now embattled founder and CEO, Elizabeth Holmes. In typical venture-backed fashion, he also earned a ridiculous pay cheque.

He shared a house in San Francisco with friends, threw huge parties and hosted weekend-long concerts. “I was living the dream,” he says. “And I felt like shit. I felt empty. I had the most privileged wake-up call you can have, where you get all the things you think are going to make you happy, and they don’t make you happy.”

Prior to his time at Theranos, he had stayed on a Virginia ashram and had trekked to India to meditate. “It was like ‘poof,’” he says, blinking hard and then looking at me deeply. “I saw the pinnacle of spiritual attainment and I thought, ‘That does not need to be religious. That can be scientific.’ And I wanted to create the technology to get there.”

With about \$60,000 saved – and the safety net of a trust fund should he fail – Siegel set out. He wrote to eight potential academic advisers. “Nobody had any fucking idea what I was talking about,” he says. Then he found Gino Yu, an associate professor and director of digital entertainment and game development at Hong Kong Polytechnic University. Yu investigates what philosophers and scientists have long called the consciousness “problem” – the murky relationship between mind and body. He uses interactive media, like video games and VR, and new tools such as electroencephalography (EEG) and functional magnetic resonance imaging (fMRI) to trace realms of perception, experience and the mind’s inner workings in real time.

Within an hour of talking to Yu, Siegel had an invitation to visit.

A week later he was on a plane. Once there, Siegel met a group of acolytes who had gathered around Yu. Among them was Jeffery Martin, a Harvard psychology graduate who had bounced around jobs and had reinvented himself in this new space. With Martin’s help, Siegel gorged himself on neuroscience literature and learned about emerging neuro-technology tools. “I spent a full year catching up, getting the complete download,” says Siegel.

Brain full, Siegel and Martin filled a whiteboard with ideas for consumer products. At the time, brain hackers had started using transcranial direct current stimulation (tDCS), attaching nine-volt batteries to electrodes on their foreheads to mildly shock their brains to increase focus and improve memory. Siegel and Martin thought they could induce meditative states this way. When Martin strapped it on, he says, “I had the most mystical experience of my life.” Their plan was to produce a device and create a bunch of crowdsourced protocols – voltage, placement of electrodes, duration, time of day – that would trigger enlightenment.

That plan, and others, fell apart. But one stuck. First, they came up with a name for their movement: consciousness hacking. “Because it was avant-garde and eye-catching,” Martin tells me. The pair envisioned a three-prong approach to foster their vision. It included an academic lab where they could study enlightenment and incubate the tech around it; a conference to connect hackers, biofeedback enthusiasts, and venture capitalists; and building out a larger cultural community.

After returning to the US, they launched their first Consciousness Hacking MeetUp, in 2013, in Siegel’s hometown of Santa Cruz. A year later they held their first conference, at Sofia University in Palo Alto, under the broad and inclusive term Transformative Technology. Soon after, Siegel quit the conference arm, splitting the brands in two, with Martin and a third partner taking over the more industry-facing conference side and Siegel taking charge of the globally expanding MeetUp scene.

**A lot of what I do is just being a schmoozer,”** says Siegel. “I’m passionate. A lot of it is connecting people with millions of other people, fertilising the space, creating a community, hosting events, speaking, travelling, that kind of stuff. Dealing with tonnes of emails.”

We’re driving down a canyon in Siegel’s black Ford Expedition, which is littered with iPhone cables and snack wrappers. In addition to organising MeetUps, he advises wearable-tech and bio-sensing startups on their market strategies, tweaking their algorithms and connecting them with software engineers and investors. One company, Sensi, uses an iPhone’s accelerometer and artificial intelligence to analyse movement, determine your mood and guide you to emotional optimisation.

“A lot of people are sitting at their desks year after year after year and saying, ‘What, more?’” says Josh Whiton, who is outdoor-yoga lithe, tanned and incredibly erudite. “Their garage is full of stuff and they don’t want any more for Christmas. So this is a resurgence for extraordinary experiences and consciousness and mind expansion.”

Whiton is highly aware of his privilege and careful to point it out. In 2004, while a student at North Carolina State University in Durham, he began building TransLoc, a transit-tech company that tracks buses in real time. It’s the official app for 300 municipal, university and corporate agencies. But feeling spiritually bereft by the work of a CEO, Whiton left several years ago to start an urban farm in Raleigh, take writing

**‘I saw spiritual attainment and I thought, “That does not need to be religious. That can be scientific”’**





courses, trade cryptocurrencies, and, as stated on his LinkedIn page, become a consciousness explorer.

When we first met at the co-hack mansion, he and Siegel hugged warmly, with Whiton letting out along “Mmmmm”. Siegel said to me, “This guy is the secret sauce.” He’s also a reliable contributor to the co-hack house’s rent and he invests in startups.

“Back in the 60s,” Whiton goes on, as Siegel drives toward the blue of the bay, “you had a lot of broke hippies living in their parents’ basements with this general ‘Fight the man, I don’t want to sit at a desk and wear a tie rebellion.’ To me, this is the 60s again, but with a new credibility.” Today, instead of broke hippies, you get people like Whiton and Siegel who are entrepreneurs and have had success. “So here I am with time and privilege and credibility,” says Whiton, who lunches with Elon Musk, counts Tony Robbins as a friend and still couch surfs. “I can go around and ask the same questions hippies do. But when I have my adventures, I’m meeting not just hippies and shamans, but venture capitalists, engineers and stock traders. That’s special.”

When I express doubt that technology, and technologists, who have created our over-stressed, socially anxious, always digitally-on

selves can now create the off-button solution – through the same sort of tech – Siegel says, “That’s legitimate.”

“Tech can support our humanity and our true nature,” says Whiton, who, I realise, is not spending this ride tapping at a phone, but is fully engaged. “It just can’t be tech products in the service of distracting you from your emotions, distracting you from your problems, which has been a major thrust of the economy. Sure, you’re mildly depressed. But we’ve got a pill for you. Sure, you don’t like your home life, but we’ve got happy hour for you. So much of the economy works on repression and distraction. But we’re seeing a shift. We have the engineering knowledge to create the tools to get us back in touch with our humanity and to regulate our emotions.”

That consumers are desperate to relax and de-stress is clear. We’re buying tens of millions of pounds’ worth of biofeedback headsets and meditation apps to get there. The next engineering challenge is teaching tech to detect things about the human experience that matter to humans. People such as Martin believe that as artificial intelligence improves, we’ll return each day to a smart home that, using facial recognition and other sensors, will know how we feel as soon as we walk through

**‘How many other altered states can we achieve? Are people ready for that? People are absolutely ready’**

the door. Our home will provide us with the sounds, lights, smells, food and words that a loved one might provide. We’ll carry biomarkers that detect our real-time cortisol levels (indicating stress) and headsets that guide us to a calmer state.

Tech giants such as Google, Apple and Adobe, concerned about the work-life balance of their workers, already provide mindfulness training and talks for their employees. Some even distribute biofeedback headsets like the Muse. And Martin’s Trans Tech conference is promoting consumer gadgets that are scalable (meaning they can be found on the walls of Best Buy) and could one day be reimbursable by insurance companies.

“Flow and empathy are about to have their mainstream moment,” Siegel says, as he pulls into a flower- and vine-covered shopping centre where we’ll eat breakfast at a place called Café Bliss. “How many other altered states can we achieve? There are a hundred more out there. Are people ready for that? People are absolutely ready.”

And not just for ego-driven self improvement, Whiton argues, but for communal coherence. Siegel himself has designed a system called HeartSync, which he first deployed at Burning Man a few years ago. It links 24 people via EEG headsets to a computer hub. Using audio cues over speakers, it lets the group sync its collective heartbeat and breathing. “So say you decided to have a board meeting and you hook everyone up to a headband and a heart-rate sensor to get into state of coherence,” says Whiton. “You get people out of their ego states and into a group state, thinking as one. And what kind of meeting would we have after that?”



**By early evening Siegel, dressed in loose-fitting guru pants, is sitting at the head of a folding table, flanked by plastic-wrapped tubs of cheeses and cold cuts. Volunteers peel the plastic and set the goodies on nearby café tables. Each month, Siegel holds his MeetUps here at Eco-Systm, a co-working space just outside the city’s financial district. The place has an artsy startup vibe.**

Tonight’s talk features Julia Moss-bridge, a Northwestern University



neuroscientist. She studies how our conscious and unconscious minds perceive and process time. Her talk, “Designing an AI to Love”, will explore whether we can create an artificial intelligence that loves, unconditionally, with the welfare of humanity at its heart.

The MeetUp is sold out. As people drift in and nibble on the meats and chocolate-covered strawberries, Siegel drifts among them, exchanging lingering hugs and introducing people he knows to other people he knows. Among them, a married couple designing therapeutic VR experiences; the head of a Burning Man camp from Ohio, in town for the group’s global leadership conference; and a smattering of young tech workers, including two women who develop user experiences for a healthcare company and had recently seen an AI talk at South by Southwest. When a young Korean woman says she recently left her marketing job at a tech company because she wants to feel fulfilled, one of Siegel’s organisers pounces. “So you’re in transition?” she says, cutting the woman off. The woman says she guesses so. But Siegel’s volunteer cuts her short again. “Would you be interested in a transitioning workshop?” asks the volunteer, turning to Siegel and nodding eagerly.

Siegel mostly earns money from his consulting, giving TED-style talks at conferences and teaching a class on meditation and technology at Stanford. MeetUp members fund its talks, but Siegel’s team is keen to expand its offerings and revenue.

To start the meeting, Siegel asks three questions: how many people have a meditation or spiritual practice? How many work in science or tech? How many want to leave their jobs for something more meaningful? Each time, three quarters of the hands go up. Satisfied, Siegel says, “We are creating a community of practice and purpose, spiritual innovation and insight.” Behind me, a young UX developer thumbing her iPhone says, “Wow, insight.” Siegel wraps up, saying, “We’re eternally conflicted and in a lot of pain. If you think that’s less than 50 per cent bullshit, you should join us.” Cost: \$10 a month, \$100 a year.

When Mossbridge takes the mic, she is wearing a tie-dye hoodie with a heart in the centre. She runs through

the archetypes we have of AI robots. They’ll be obedient children, “like slaves that do what we say”, she says, “saving us from danger”. On a screen, she shows a clip of the robot in *Interstellar* carrying Anne Hathaway to safety. “Or they’ll be evil tyrants that overtake us and tell us what to do.” Something Mossbridge says we secretly desire. Or we can program them to help us achieve our greatest potential. Just as human beings are not the smartest operating systems, we are not the most benevolent. We may need to build an AI more compassionate than we are – to save us from ourselves, to shift consciousness toward enlightenment. In that way we don’t have to just hope, afterward, the machine we built is nice. During the Q&A, a man stands and asks, “What’s the purpose?” Mossbridge says, “I imagine a world where each person is paired with a loving AI that teaches us to love better.”



**After the meeting, an older couple** (with old-school grocery industry money) give Siegel a cheque for \$200,000 to fund his MeetUps and explore AI and consciousness. The Burning Man guy, whose camp offers energy work and eye-contact jams, talks blockchains with the young UX developers. Siegel, smiling beatifically, nods his way through the crowd. Unlike the scene at The Battery, with its Adobe marketing execs and Facebook product launchers, this one seems full of true seekers, people who maybe don’t want what Silicon Valley is offering, but still believe technology will free them from anxieties that technology itself has created.

There’s talk of online AIs offering bespoke psychotherapy, tailoring modalities for each of our ills, with none of the baggage that human therapists carry (even though those AIs will need to be programmed by actual humans). There’s chatter about brain stimulators that will one day tickle our neuron networks so they dump on happiness chemicals like dopamine, serotonin, endorphins and oxytocin.

Advances in virtual reality might teach us, and some studies suggest they can, to become more altruistic.



**Above: A MeetUp guest tries a virtual reality demo.**

**Opposite page: Brandon Bosch, co-founder of Brilliant Elixir, invites guests to try his Herbal MoonShine**

But, like a knife, it could cut the other way. “You could just say, ‘Who needs a planet?’” Whiton posits to me one day, “I got this many pixels.”

The brain itself might prove the ultimate battleground. Studies show that our grey matter might contain its own dimethyltryptamine, a powerful hallucinogen that can induce a mystical high. Like all hallucinogens, it has the potential to radically shift your experiences and transform your personality in a single trip. What happens when we create the enlightenment button, using tech to trigger a cascade of hallucinogens? Does the government regulate that like an illegal drug?

That’s the sort of big question – how much consciousness shifting can we take? – that Whiton and Siegel can debate endlessly, like turned-on college grads. How much will others allow, before – like previous mind-expanding experiments – it all goes to hell and someone with top-down control shuts it down?

“You’ve got all this mindfulness stuff happening in big companies, but how much mindfulness are they really ready for?” Whiton pondered earlier at Café Bliss. “Do they just want their workers at their desks stress free? Because what Mike and I have found is if you meditate too long, you decide your job is not for you. I’m not sure companies want you to be self-actualised to the point where you realise, ‘This isn’t working in a really kind of soulless way. I got it. I’m out.’”

“It’s a very real possibility,” Siegel replied, sitting crossed-legged and leaning over his tea. “Like, what’s the dosage, right? Where people are just like, ‘Well, fuck this.’”

*Kevin Gray wrote about Kobalt Music Group in issue 05.15*









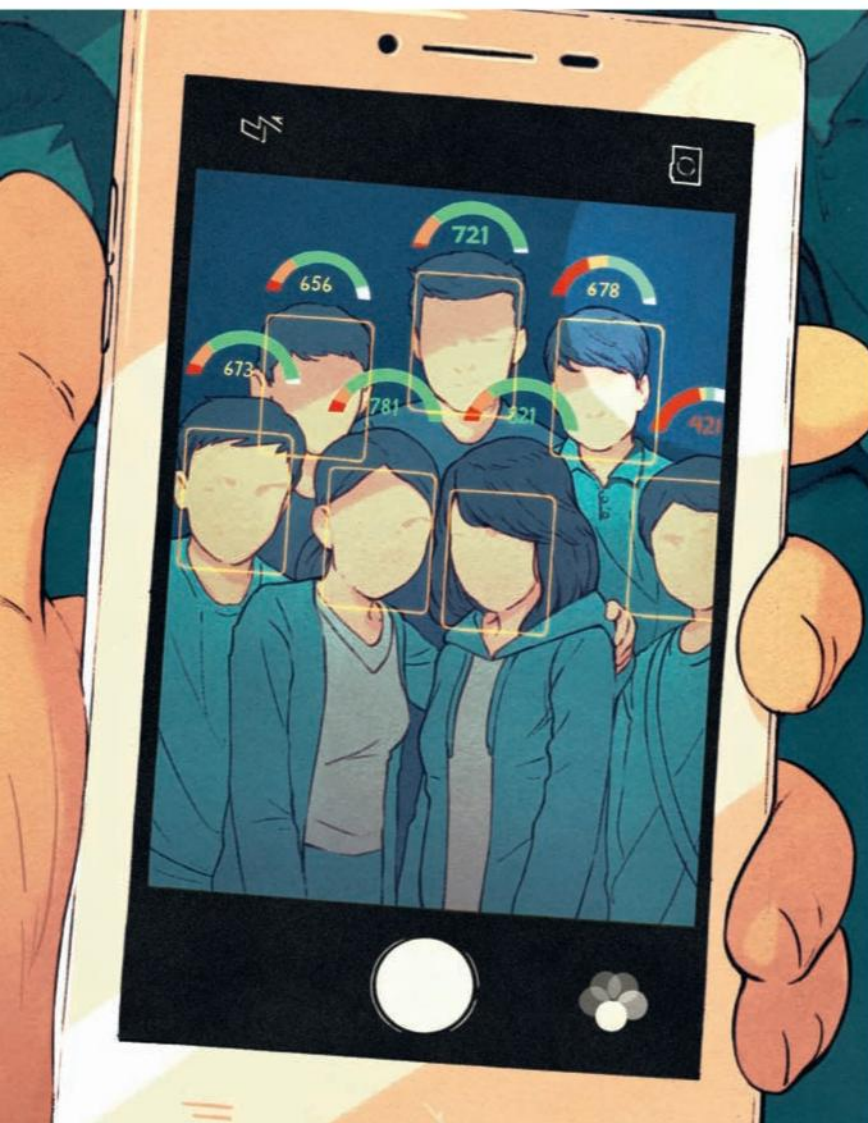
# Big data meets Big Brother

The Chinese government plans to judge the trustworthiness – or otherwise – of its 1.3 billion residents with its Social Credit Score. Does such a rating system spell the end for civil privacy?

by Rachel Botsman

Illustration: Kevin Hong





the system as a desirable way to measure and enhance “trust” nationwide and to build a culture of “sincerity”. As the policy states, “It will forge a public opinion environment where keeping trust is glorious. It will strengthen sincerity in government affairs, commercial sincerity, social sincerity and the construction of judicial credibility.”

Others are less sanguine about its wider purpose. “It is very ambitious in both depth and scope, including scrutinising individual behaviour and what books people are reading. It’s Amazon’s consumer tracking with an Orwellian political twist,” is how Johan Lagerkvist, a Chinese internet specialist at the Swedish Institute of International Affairs, described the social credit system. Rogier Creemers, a post-doctoral scholar specialising in Chinese law and governance at the Van Vollenhoven Institute at Leiden University, who published a comprehensive translation of the plan, compared it to “Yelp reviews with the nanny state watching over your shoulder”.

For now, technically, participating in China’s Citizen Scores is voluntary. But by 2020 it will be mandatory. The behaviour of every single citizen and legal person (which includes every company or other entity) in China will be rated and ranked, whether they like it or not.

**PRIOR TO ITS NATIONAL ROLL-OUT IN 2020,** the Chinese government is taking a watch-and-learn approach. In this marriage between communist oversight and capitalist can-do, the government has given a licence to eight private companies to come up with systems and algorithms for social credit scores. Predictably, data giants currently run two of the best-known projects.

The first is with China Rapid Finance, a partner of the social-network behemoth Tencent and developer of the messaging app *WeChat* with more than 850 million active users. The other, Sesame Credit, is run by the Ant Financial Services Group (AFSG), an affiliate company of Alibaba. Ant Financial sells insurance products and provides loans to small- to medium-sized businesses. However, the real star of Ant is AliPay, its payments arm that people use not only to buy things

**O**N JUNE 14, 2014, THE STATE COUNCIL OF CHINA PUBLISHED AN OMINOUS-sounding document called “Planning Outline for the Construction of a Social Credit System”. In the way of Chinese policy documents, it was a lengthy and rather dry affair, but it contained a radical idea. What if there was a national trust score that rated the kind of citizen you were?

Imagine a world where many of your daily activities were constantly monitored and evaluated: what you buy at the shops and online; where you are at any given time; who your friends are and how you interact with them; how many hours you spend watching content or playing video games; and what bills and taxes you pay (or not). It’s not hard to picture, because most of that already happens, thanks to all those data-collecting behemoths like Google, Facebook and Instagram or health-tracking apps such as Fitbit. But now imagine a system where all these behaviours are rated as either positive or negative and distilled into a single number, according to rules set by the government. That would create your Citizen Score and it would tell everyone whether or not you were trustworthy. Plus, your rating would be publicly ranked against that of the entire population and used to determine your eligibility for a mortgage or a job, where your children can go to school – or even just your chances of getting a date.

A futuristic vision of Big Brother out of control? No, it’s already getting underway in China, where the government is developing the Social Credit System (SCS) to rate the trustworthiness of its 1.3 billion citizens. The Chinese government is pitching



online, but also for restaurants, taxis, school fees, cinema tickets and even to transfer money to each other.

Sesame Credit has also teamed up with other data-generating platforms, such as Didi Chuxing, the ride-hailing company that was Uber's main competitor in China before it acquired the American company's Chinese operations in 2016, and Baihe, the country's largest online matchmaking service. It's not hard to see how that all adds up to gargantuan amounts of big data that Sesame Credit can tap into to assess how people behave and rate them accordingly.

So just how are people rated? Individuals on Sesame Credit are measured by a score ranging between 350 and 950 points. Alibaba does not divulge the "complex algorithm" it uses to calculate the number but they do reveal the five factors taken into account. The first is credit history. For example, does the citizen pay their electricity or phone bill on time? Next is fulfilment capacity, which it defines in its guidelines as "a user's ability to fulfil his/her contract obligations". The third factor is personal characteristics, verifying personal information such as someone's mobile phone number and address. But the fourth category, behaviour and preference, is where it gets interesting.

Under this system, something as innocuous as a person's shopping habits become a measure of character. Alibaba admits it judges people by the types of products they buy. "Someone who plays video games for ten hours a day, for example, would be considered an idle person," says Li Yingyun, Sesame's Technology Director. "Someone who frequently buys diapers would be considered as probably a parent, who on balance is more likely to have a sense of responsibility." So the system not only investigates behaviour – it shapes it. It "nudges" citizens away from purchases and behaviours the government does not like.

Friends matter, too. The fifth category is interpersonal relationships. What does their choice of

online friends and their interactions say about the person being assessed? Sharing what Sesame Credit refers to as "positive energy" online, nice messages about the government or how well the country's economy is doing, will make your score go up.

Alibaba is adamant that, currently, anything negative posted on social media does not affect scores (we don't know if this is true or not because the algorithm is secret). But you can see how this might play out when the government's own citizen score system officially launches in 2020. Even though there is no suggestion yet that any of the eight private companies involved in the ongoing

pilot scheme will be ultimately responsible for running the government's own system, it's hard to believe that the government will not want to extract the maximum amount of data for its SCS, from the pilots. If that happens, and continues as the new normal under the government's own SCS it will result in private platforms acting essentially as spy agencies for the government. They may have no choice.

Posting dissenting political opinions or links mentioning Tiananmen Square has never been wise in China, but now it could directly hurt a citizen's rating. But here's the real kicker: a person's own score will also be affected by what their online friends say and do, beyond their own contact with them. If someone they are connected to online posts a negative comment, their own score will also be dragged down.

So why have millions of people already signed up to what amounts to a trial run for a publicly endorsed government surveillance system? There may be darker, unstated reasons – fear of reprisals, for instance, for those who don't put their hand up – but there is also a lure, in the form of rewards and "special privileges" for those citizens who prove themselves to be "trustworthy" on Sesame Credit.

If their score reaches 600, they can take out a Just Spend loan of up to 5,000 yuan (around £565) to use to shop online, as long as it's on an Alibaba site. Reach 650 points, they may rent a car without leaving a deposit. They are also entitled to faster check-in at hotels and use of the VIP check-in at Beijing Capital International Airport. Those with more than 666 points can get a cash loan of up to 50,000 yuan (£5,700), obviously from Ant Financial Services. Get above 700 and they can apply for Singapore travel without supporting documents such as an employee letter. And at 750, they get fast-tracked application to a coveted pan-European Schengen visa. "I think the best way to understand the system is as a sort of bastard love child of a loyalty scheme," says Creemers.

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Higher scores have already become a status symbol, with almost 100,000 people bragging about their scores on Weibo (the Chinese equivalent of Twitter) within months of launch. A citizen's score can even affect their odds of getting a date, or a marriage partner, because the higher their Sesame rating, the more prominent their dating profile is on Baihe.

Sesame Credit already offers tips to help individuals improve their ranking, including warning about the downsides of friending someone who has a low score. This might lead to the rise of score advisers, who will share tips on how to gain points, or reputation consultants willing to offer expert advice on how to strategically improve a ranking or get off the trust-breaking blacklist.

Indeed, Sesame Credit is basically a big data gamified version of the Communist Party's surveillance methods; the disquieting *dang'an*. The regime kept a dossier on every individual that tracked political and personal transgressions. A citizen's *dang'an* followed them for life, from schools to jobs. People started reporting on friends and even family members, raising suspicion and lowering social trust in China. The same thing will happen with digital dossiers. People will have an incentive to say to their friends, spouses, family and colleagues, "Don't post that. I don't want you to hurt your score but I also don't want you to hurt mine."

We're also bound to see the birth of reputation black markets selling under-the-counter ways to boost trustworthiness. In the same way that Facebook Likes and Twitter followers can be bought, individuals will pay to manipulate their score. And what about keeping the system secure? Hackers (some even state-backed) could go in and change or steal the digitally stored information.

**THE NEW SYSTEM REFLECTS A** cunning paradigm shift. As we've noted, instead of trying to enforce stability or conformity with a big stick and a good dose of top-down fear, the government is attempting to make obedience feel like gaming. It

is a method of social control dressed up in some points-reward system. It's gamified obedience.

In a trendy neighbourhood in downtown Beijing, the BBC news services hit the streets in October 2015 to ask people about their Sesame Credit ratings. Most spoke about the upsides. But then, who would publicly criticise the system? Ding, your score might go down. Alarming, few people seemed to understand that a bad score could hurt them in the future. Even more concerning was how many people had no idea that they were being constantly rated.

Currently, Sesame Credit does not directly penalise people for being "untrustworthy" – it's more effective to lock people in with treats for good behaviour. But Hu Tao, Sesame Credit's chief manager, warns people that the system is designed so that "untrustworthy people can't rent a car, can't borrow money or even can't find a job". She has even disclosed that Sesame Credit has approached China's Education Bureau about sharing a list of its students who cheated on national examinations, in order to make them pay into the future for their dishonesty.

Penalties are set to change dramatically when the government system becomes mandatory in 2020. Indeed, on September 25, 2016, the State Council General Office updated its policy entitled "Warning and Punishment Mechanisms for Persons Subject to Enforcement for Trust-Breaking". The overriding principle is simple: "If trust is broken in one place, restrictions are imposed everywhere," the policy document states.

For instance, people with low ratings will have slower internet speeds; restricted access to restaurants, nightclubs or golf courses; and the removal of the right to travel freely abroad with, I quote, "restrictive control on consumption within holiday areas or travel businesses". Scores will influence a person's rental applications, their ability to get insurance or a loan and even social-security benefits. Citizens with low scores will not be hired by certain employers and will be forbidden from obtaining some

People with low ratings will have slower internet speeds, restricted access to restaurants and the removal of the right to travel with 'restrictive control on consumption within holiday areas or travel businesses'

jobs, including in the civil service, journalism and legal fields, where of course you must be deemed trustworthy. Low-rating citizens will also be restricted when it comes to enrolling themselves or their children in high-paying private schools. I am not fabricating this list of punishments. It's the reality Chinese citizens will face. As the government document states, the social credit system will "allow the trustworthy to roam everywhere under heaven while making it hard for the discredited to take a single step".

According to Luciano Floridi, a professor of philosophy and ethics of information at the University of Oxford and the director of research at the Oxford Internet Institute, there have been three critical "de-centering shifts" that have altered our view in self-understanding: Copernicus's model of the Earth orbiting the



Sun; Darwin's theory of natural selection; and Freud's claim that our daily actions are controlled by the unconscious mind.

Floridi believes we are now entering the fourth shift, as what we do online and offline merge into an onlife. He asserts that, as our society increasingly becomes an infosphere, a mixture of physical and virtual experiences, we are acquiring an onlife personality – different from who we innately are in the “real world” alone. We see this writ large on Facebook,

where people present an edited or idealised portrait of their lives. Think about your Uber experiences. Are you just a little bit nicer to the driver because you know you will be rated? But Uber ratings are nothing compared to Peeple, an app launched in March 2016, which is like a Yelp for humans. It allows you to assign ratings and reviews to everyone you know – your spouse, neighbour, boss and even your ex. A profile displays a “Peeple Number”, a score based on all the feedback and recommenda-

tions you receive. Worryingly, once your name is in the Peeple system, it's there for good. You can't opt out.

Peeple has forbidden certain bad behaviours including mentioning private health conditions, making profanities or being sexist (however you objectively assess that). But there are few rules on how people are graded or standards about transparency.

China's trust system might be voluntary as yet, but it's already having consequences. In February 2017, the country's Supreme People's Court announced that 6.15 million of its citizens had been banned from taking flights over the past four years for social misdeeds. The ban is being pointed to as a step toward black-listing in the SCS. “We have signed a memorandum... [with over] 44 government departments in order to limit ‘discredited’ people on multiple levels,” says Meng Xiang, head of the executive department of the Supreme Court. Another 1.65 million black-listed people cannot take trains.

Where these systems really descend into nightmarish territory is that the trust algorithms used are unfairly reductive. They don't take into account context. For instance, one person might miss paying a bill or a fine because they were in hospital; another may simply be a freeloader. And therein lies the challenge facing all of us in the digital world, and not just the Chinese. If life-determining algorithms are here to stay, we need to figure out how they can embrace the nuances, inconsistencies and contradictions inherent in human beings and how they can reflect real life.



Y

OU COULD SEE CHINA'S SO-CALLED TRUST PLAN AS ORWELL'S 1984 MEETS Pavlov's dogs. Act like a good citizen, be rewarded and be made to think you're having fun. It's worth remembering, however, that personal scoring systems have been present in the west for decades.

More than 70 years ago, two men called Bill Fair and Earl Isaac invented credit scores. Today, companies use FICO scores to determine many financial decisions, including the interest rate on our mortgage or whether we should be given a loan.

For the majority of Chinese people, they have never had credit scores and so they can't get credit. “Many people don't own houses, cars or credit cards in China, so that kind of information isn't available to measure,” explains Wen Quan, an influential blogger who writes about technology and finance. “The central bank has the financial data from 800 million people, but only 320 million have a traditional credit history.” According to the Chinese Ministry of Commerce, the annual economic loss caused by lack of credit information is more than 600 billion yuan (£68bn).

China's lack of a national credit system is why the government is adamant that Citizen Scores are long overdue and badly needed to fix what they refer to as a “trust deficit”.

In a poorly regulated market, the sale of counterfeit and substandard products is a massive problem. According to the Organization for Economic Co-operation and Development (OECD), 63 per cent of all fake goods, from watches to handbags to baby food, originate from China. “The level of micro corruption is enormous,” Creemers says. “So if this particular scheme results in more effective oversight and accountability, it will likely be warmly welcomed.”

The government also argues that the system is a way to bring in those people left out of traditional credit systems, such as students and low-income households. Professor Wang Shuqin from the Office of Philosophy and Social Science at Capital Normal University in China recently won the bid to help the government develop the system that she refers to as “China’s Social Faithful System”. Without such a mechanism, doing business in China is risky, she stresses, as about half of the signed contracts are not kept. “Given the speed of the digital economy it’s crucial that people can quickly verify each other’s creditworthiness,” she says. “The behaviour of the majority is determined by their world of thoughts. A person who believes in socialist core values is behaving more decently.” In other words, she regards the “moral standards” the system assesses, as well as financial data, as a bonus.

Indeed, the State Council’s aim is to raise the “honest mentality and credit levels of the entire society” in order to improve “the overall competitiveness of the country”. Is it possible that the SCS is in fact a more desirably transparent approach to surveillance in a country that has a long history of watching its citizens? “As a Chinese person, knowing that everything I do online is being tracked, would I rather be aware of the details of what is being monitored and use this information to teach myself how to abide by the rules?” says Rasul Majid, a Chinese blogger based in Shanghai who writes about behavioural design and gaming psychology. “Or would I rather live in ignorance and hope/wish/dream that personal privacy still exists and that our ruling bodies respect us enough not to take advantage?” Put simply, Majid thinks the system gives him a tiny bit more control over his data.



W

**HEN I TELL WESTERNERS ABOUT THE SOCIAL CREDIT SYSTEM** in China, their responses are fervent and visceral. Yet we already rate restaurants, movies, books and even doctors. Facebook, meanwhile, is now capable of identifying you in pictures without seeing your face; it only needs your clothes,

hair and body type to tag you in an image with 83 per cent accuracy.

In 2015, the OECD published a study revealing that in the US there are at least 24.9 connected devices per 100 inhabitants. All kinds of companies scrutinise the “big data” emitted from these devices to understand our lives and desires, and to predict our actions in ways that we couldn’t even predict ourselves.

Governments around the world are already in the business of monitoring and rating. In the US, the National Security Agency (NSA) is not the only official digital eye following the movements of its citizens. In 2015, the US



Transportation Security Administration proposed the idea of expanding the PreCheck background checks to include social-media records, location data and purchase history. The idea was scrapped after heavy criticism, but that doesn't mean it's dead. We already live in a world of predictive algorithms that determine if we are a threat, a risk, a good citizen and even if we are trustworthy. We're getting closer to the Chinese system – the expansion of credit scoring into life scoring – even if we don't know we are.

So are we heading for a future where we will all be branded online and data-mined? It's certainly trending that way. Barring some kind of mass

citizen revolt to wrench back privacy, we are entering an age where an individual's actions will be judged by standards they can't control and where that judgement can't be erased. The consequences are not only troubling; they're permanent. Forget the right to delete or to be forgotten, to be young and foolish.

While it might be too late to stop this new era, we do have choices and rights we can exert now. For one thing, we need to be able rate the raters. In his book *The Inevitable*, Kevin Kelly describes a future where the watchers and the watched will transparently track each other. "Our central choice now is whether this surveillance is a secret, one-way panopticon – or a mutual, transparent

kind of 'coveillance' that involves watching the watchers," he writes.

Our trust should start with individuals within government (or whoever is controlling the system). We need trustworthy mechanisms to make sure ratings and data are used responsibly and with our permission. To trust the system, we need to reduce the unknowns. That means taking steps to reduce the opacity of the algorithms. The argument against mandatory disclosures is that if you know what happens under the hood, the system could become rigged or hacked. But if humans are being reduced to a rating that could significantly impact their lives, there must be transparency in how the scoring works.

In China, certain citizens, such as government officials, will likely be deemed above the system. What will be the public reaction when their unfavourable actions don't affect their score? We could see a Panama Papers 3.0 for reputation fraud.

It is still too early to know how a culture of constant monitoring plus rating will turn out. What will happen when these systems, charting the social, moral and financial history of an entire population, come into full force? How much further will privacy and freedom of speech (long under siege in China) be eroded? Who will decide which way the system goes? These are questions we all need to consider, and soon. Today China, tomorrow a place near you. The real questions about the future of trust are not technological or economic; they are ethical.

If we are not vigilant, distributed trust could become networked shame. And life will become one endless popularity contest, with us all feverishly vying for the highest rating that only a few can attain. ■

*This is an extract from Who Can You Trust? How Technology Brought Us Together and Why It Might Drive Us Apart (Penguin Portfolio) by Rachel Botsman, published on October 4. Since this piece was written, The People's Bank of China delayed the licences to the eight companies conducting social credit pilots. The government's plans to launch the Social Credit System in 2020 remain unchanged*

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# The colophon



## Mind expansion this month

Photographer Gregg Segal writes: "I'm sick of seeing couples out at dinner, engrossed in their smartphones, barely noticing one another. So when I was asked to shoot pictures for WIRED's piece on Consciousness Hacking – which claims to use tech to bring us together – I was sceptical. But at the hacking MeetUp in San Francisco, I noticed something: everyone was looking at each other, and at a deeper level. As the evening evolved, guests were connecting with more than eye contact. They got in touch on the dance floor, too (*above*). A guy with a handlebar moustache and a baseball cap with "You Are Brilliant" embossed on it invited guests to sample his Herbal Moonshine, Apple Afterglow and other botanical elixirs. Even if they seemed a little like counter-culture caricatures, the consciousness-hacking movement has its heart in the right place. The fact that its game plan includes making a buck doesn't cost them points in my book: after all, I'd rather see Herbal Moonshine for sale at my local grocery store than Coca-Cola. Until Coca-Cola buys Herbal Moonshine, anyway..."

## Office rage this month

It's not all launch parties and Ferrari-driving for WIRED's product editor. Here are his top-three causes of fury during this making of this issue:

- ◆ Products being held for too long by overseas customs.
- ◆ Voicemail from a courier who didn't include any returning details.
- ◆ The resolution on a passenger-plane's screen being too low.

## Common sense this month

A murmur of approval emanated from our writers' desk this month after the chief sub decided to stop italicising app names. The story that broke the camel's back? This month's *Insta...* err, Instagram feature. Rumours of a metric-measurement U-turn have been greatly exaggerated.

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## The WIRED Index

# 400

Amount of hours of video uploaded to YouTube every minute by its billion-plus users, who account for a third of all people on the internet

# TWELVE

The number of passengers a commercial plane may have to lose in order to meet weight requirements in future decades. As global warming increases, planes taking off at the hottest times of the day could face restrictions because warmer air particles generate less lift

# 8.3 BILLION TONNES

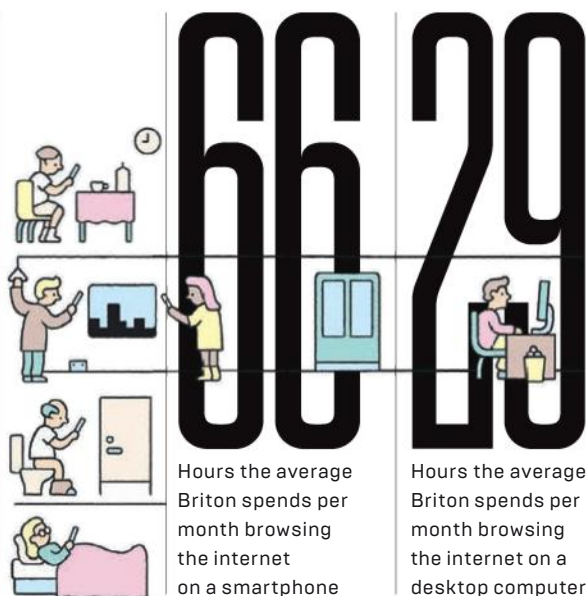
The amount of plastic humans have produced since the 50s, most of which is predicted to end up in landfill or polluting countries and oceans

# 34 BILLION TONNES

The projected amount of plastic humans will produce by 2050, 12 billion of which is expected to end up in landfills or polluting the environment

# 4%

The proportion of adults aged 18 to 70 who work in the gig economy. This number could grow by up to 12 per cent in 2018. Fifty-eight per cent of gig-economy workers are in traditional employment



# 15,000,000

The estimated number of UK jobs at risk of automation, according to a report on social mobility by the Sutton Trust. Sixty-three per cent of these will be affected to a medium or large extent, with those from a higher socio-economic position better placed to develop more in-demand skills

# 1.4BN

The number of data records lost or stolen worldwide in 2016, according to online security company Gemalto





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